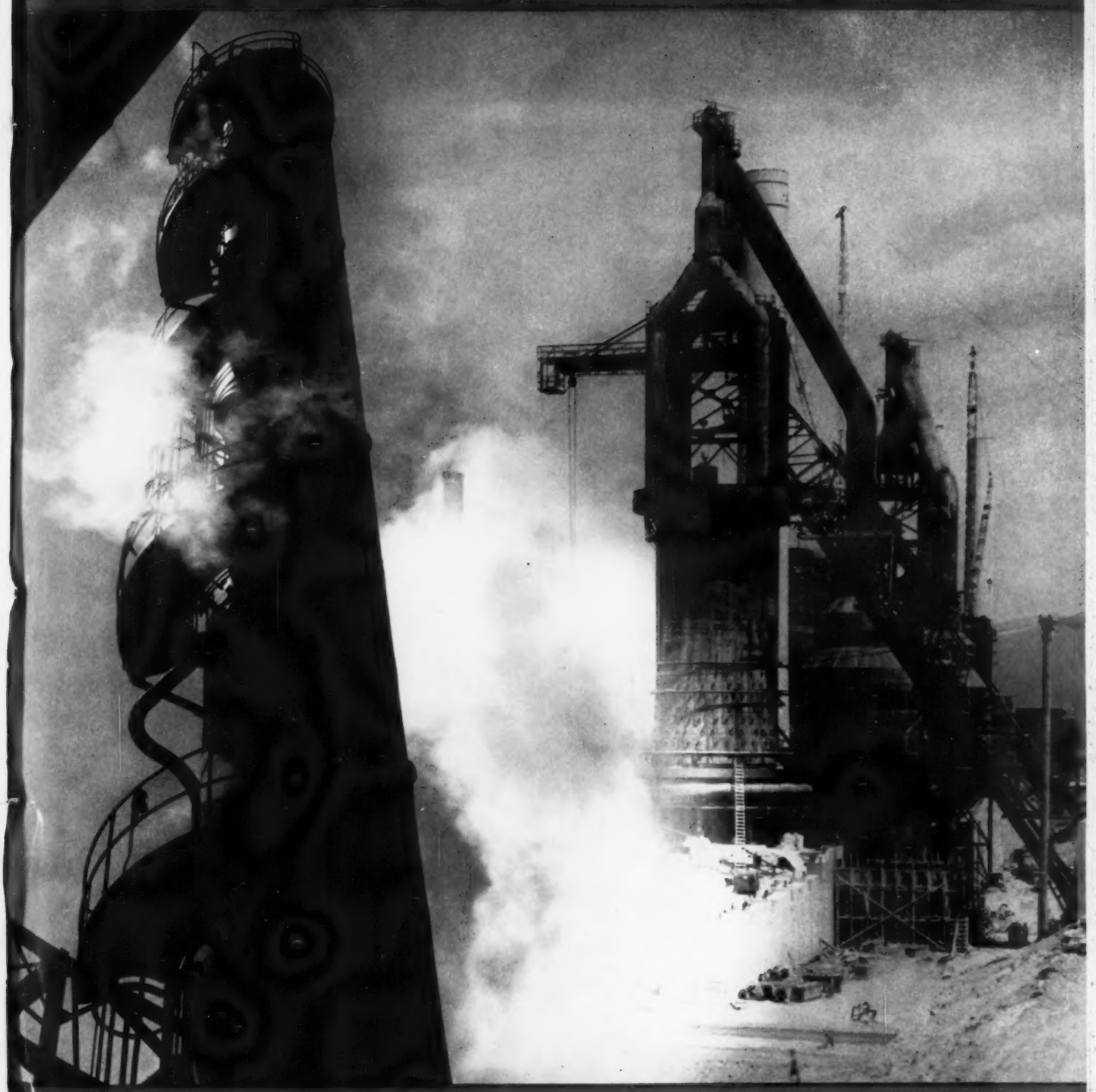
ELECTRICAL WEST

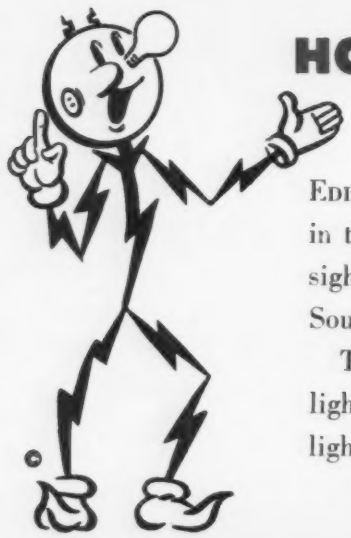
SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U. S.



Graw-Hill Co.
of California

OCTOBER 1944

25c a Copy



HOLDING THE "GOOD LIGHTING" LINE

EDISON COMPANY advertising continues to stress the importance of good light in the home. Shown here is the current series of Edison "better light for better sight" advertisements, appearing in 200 newspapers throughout Central and Southern California.

These advertisements are designed to help Edison customers improve their lighting with their present equipment. They serve to "hold the line" until new lighting equipment again is available.

SOUTHERN CALIFORNIA
Edison
"Protect their eyes with Good Light"
* Use large enough bulbs
* Have enough lamps
* Shade all bulbs to avoid glare
* Use light-colored shades
* Sit close to the light
* Keep bulbs and fixtures clean
"Close work demands Good Light"
* Use large enough bulbs
* Have enough lamps
* Shade all bulbs to avoid glare
* Use light-colored shades
* Sit close to the light
* Keep bulbs and fixtures clean
Edison
"Good Light is an aid to better study"
* Use large enough bulbs
* Have enough lamps
* Shade all bulbs to avoid glare
* Use light-colored shades
* Sit close to the light
* Keep bulbs and fixtures clean
Edison
Edison
* Use large enoug
* Have enough li
* Shade all bulbs
"IT TAKES GOOD

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), October, 1944. Vol. 93, No. 4. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, 4, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, Canada and Pan-America, $2 per year; all other countries, $3 gold. Single copy 25c.
Copyright, 1944. McGraw-Hill Company of California.

Question: What's the accuracy classification of this instrument transformer?

Type JW-1 current transformer, 5000 volts, for high-accuracy metering

Answer:

ASA Burden	B-0.1	B-0.2	B-0.5	B-2
ASA Accuracy Class	0.3	0.3	0.3	0.3

This means that with standard ASA burdens, the ratio correction factor and the transformer correction factor will be within the limits of the ASA accuracy class 0.3.

NEMA Burden	X	Y	Z
NEMA Accuracy Class	¼	¼	¼

This means that with standard NEMA burdens, the ratio error and the phase-angle error will be within the limits of the NEMA ¼ accuracy class.

How Accuracy Classification Helps You

IN the selection and application of instrument transformers, a thorough knowledge of the new ASA system of accuracy classification can help a great deal.

For example, different applications often require different transformer characteristics. A transformer that is satisfactory for metering purposes (highest accuracy up to 100 per cent of its current rating) may not be satisfactory for relaying purposes where the *overcurrent* characteristics (currents as much as 20 times normal) must be considered.

The new ASA accuracy standards have made possible the most precise method of selecting instrument transformers yet devised. All G-E instrument transformers are classified in accordance with these standards.

This enables you to select the transformer with the most suitable characteristics for the job to be done. *General Electric Company, Schenectady 5, N. Y.*

BUY ALL THE BONDS YOU CAN—*KEEP ALL THE BONDS YOU BUY*

GENERAL ELECTRIC

604-18-6400

FOR A BETTER UNDERSTANDING OF ACCURACY CLASSIFICATION

This publication explains the ASA accuracy standards for current and potential transformers and shows how they differ from the NEMA standards. Also, you will find this booklet a handy guide to the selection of G-E instrument transformers. Ask for your copy today. Address the G-E office nearest you.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

ELECTRICAL WEST

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Cover photo: Oil and steel, two basic industries of the industrial West.

CHANGE OF ADDRESS

Circulation Manager,
Electrical West,
68 Post St.,
San Francisco 4, Calif.

Please change my address

From .....

To .....

Signed .....

People

H. H. Gillings

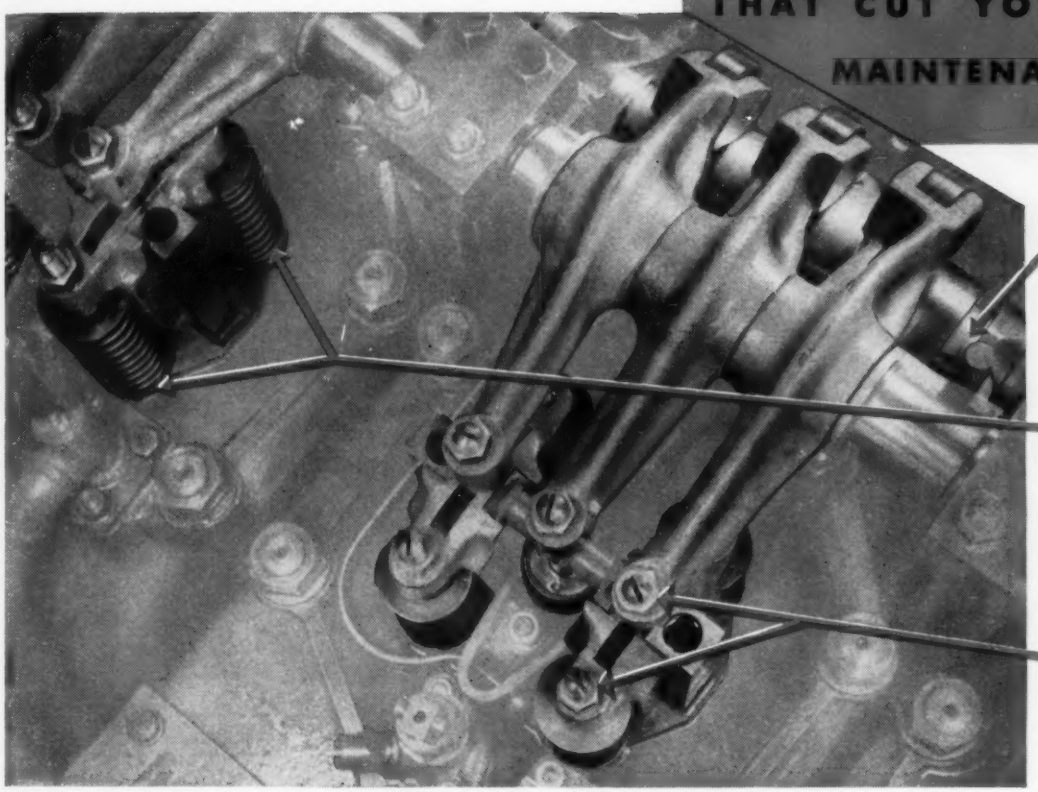
electrical engineer for Basic Magnesium, Inc., who tells on page 70 of maintenance problems in this immense industrial plant, is the presiding genius and motivating force that makes the electrical system "click". "Red" was resident engineer for J. M. Montgomery Co., contractor, during construction and supervised installation of all high-voltage equipment. He is well known throughout the Southwest for his work with the Montgomery company, Metropolitan Water District, Southern California Edison Co., and the Six Companies, Inc.

Preview

Distribution engineering and planning is one of the hottest subjects among utility engineers today. Greatly accelerated postwar sales campaigns to build domestic load are expected to double, perhaps, residential consumption during the first five years following the war. Engineers are seeking design economy to cope with these higher densities.

In the November issue of ELECTRICAL WEST, there will be a symposium on distribution engineering that will bring out the thinking and planning of prominent distribution engineers of the West. Major articles on two of the most outstanding developments in this area will be featured. One will tell of the Spokane, 13.2-kv. distribution with engineering reasoning and unit costs, and the other will deal with the 4-kv. primary network of the Puget Sound Power & Light Co. Another article will bring out some interesting construction ideas of a Colorado utility to reduce distribution costs.

THREE HENDY FEATURES THAT CUT YOUR DIESEL MAINTENANCE COSTS



1. OVERHEAD CAMSHAFT

Reduces maintenance by eliminating parts and complicated linkage.

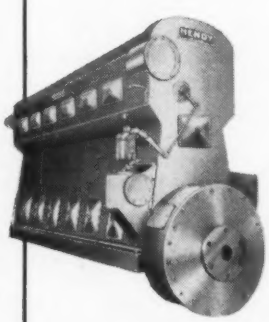
2. DIRECT-ACTUATED DUAL VALVES

Reduce maintenance by prolonging valve-stem and guide life.

3. HYDRAULIC TAPPETS

Reduce maintenance by eliminating manual tappet adjustment.

HENDY SERIES 50 DIESELS



Hendy Diesels—6 or 8 cylinders, from 350 to 675 hp—are designed for marine and industrial use—or with Hendy generators, as complete electric generating plants.

Write today for complete data, ask for the new Hendy Series 50 Diesel Engine Catalog.

These three features of the Hendy Series 50 Diesel contribute directly to the lower maintenance costs a successful Diesel operator expects and must have.

The overhead camshaft eliminates the linkage of push-rods and valve-lifters for each cylinder—cutting maintenance by reducing the number of wear points. The valve mechanism, pressure-lubricated through hollow rocker-arm shafts, lasts longer because positive-acting cross heads, or dividers, assure even pressure on dual intake and exhaust valves and eliminate side thrust. Hydraulic tappets automatically maintain correct tappet clearance at all times, making manual adjustment unnecessary.

Any one of these features in a Diesel is an aid to lower maintenance costs. But the Hendy Diesel has all three. Even more, the Hendy Diesel has many other advantages never before combined in a single engine. Investigate the advantages of this modern Diesel today.

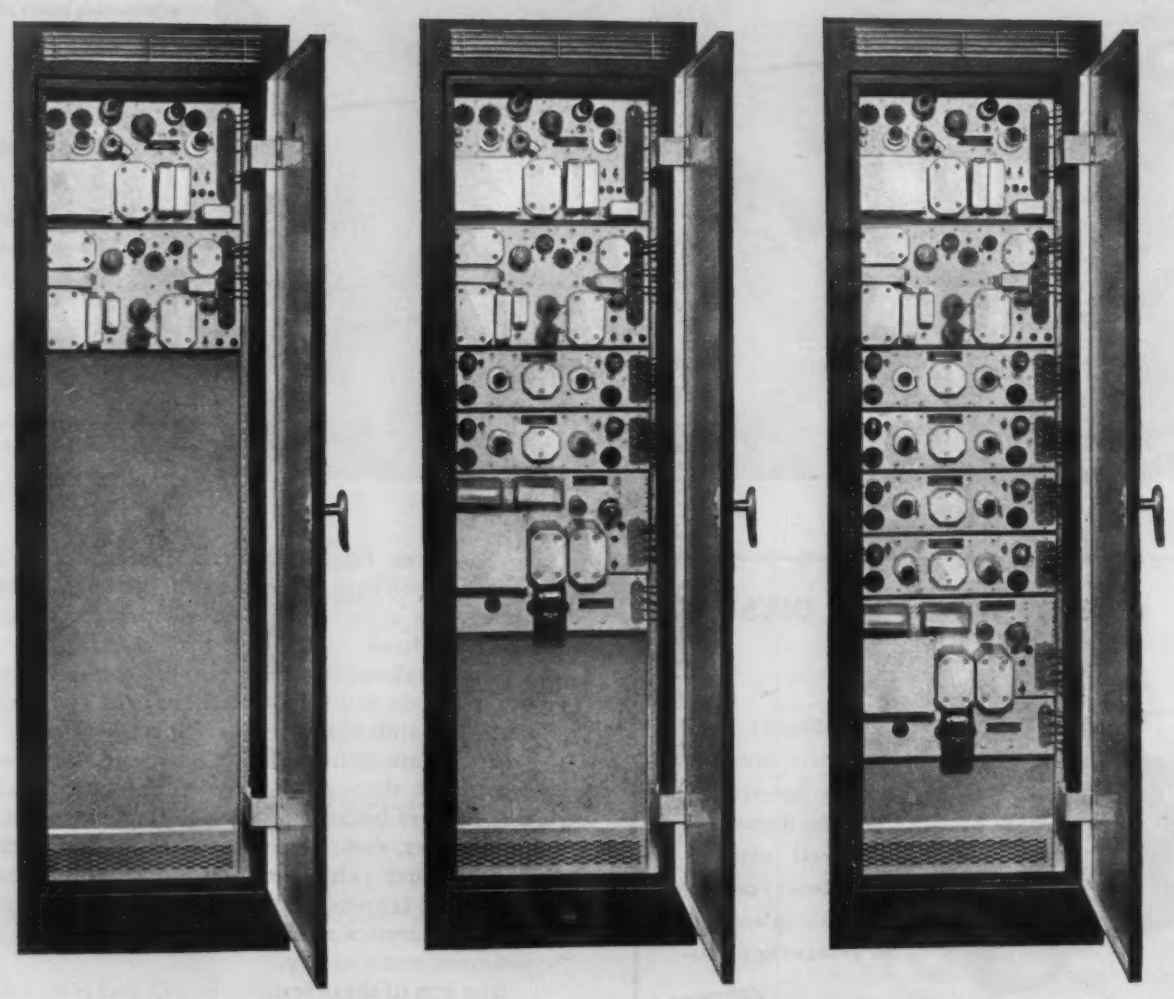
JOSHUA HENDY IRON WORKS
ESTABLISHED 1856
SUNNYVALE, CALIFORNIA

45-V

Branch Offices: BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • ST. LOUIS • WASHINGTON • LOS ANGELES

YOU CAN BUILD UP YOUR G-E

STEP-BY-STEP



Standardized unit design — more than 20 years of practical engineering experience in the field — proved quality manufacture. . . . These are evidence that G-E carrier-current equipment offers *easy and economical installation — dependable performance — greater operating efficiency — better service to you and your community.*

GENERAL ELECTRIC

CARRIER-CURRENT SERVICES

G-E standardized unit design offers the ideal way to initiate carrier-current communication, control, protection and indication services — either as additions to or as conversions from existing wire-line systems.

Start, for instance, with telephony and telemetering, two carrier-current services that are increasingly required at the same locations. They come in standardized "packaged" panel units for transmitting and receiving. The units are assembled, drawer-like, in G-E standardized cabinets, and the two services may be operated through the same coupling capacitors and use the same line traps. Several telemetering services may be electrically combined to use a single broad-band carrier channel. Basic transmitters and receivers and many other fully co-ordinated units provide the *best* combination for your needs.

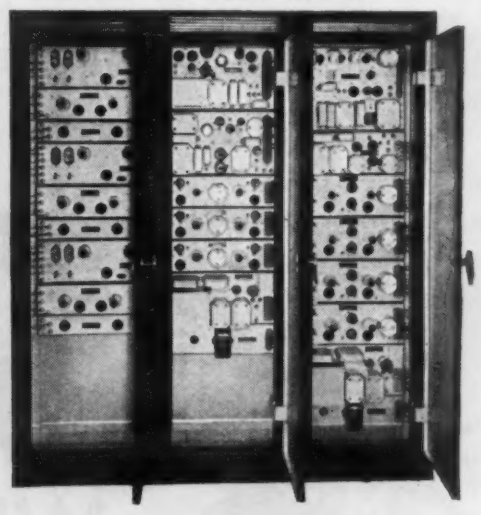
Additions — like line protection, transferred tripping, signaling, automatic load control, line sectionalizing control—are readily made, at any time . . . singly, in pairs, or in multiple combinations as may fit your immediate needs or your program of expansion or modernization. For the possible number of combinations are legion and more "match and line up" cabinets are available when the space in the original cabinets is filled.

The advantages of starting your G-E carrier systems *now* are great! — to enable present power systems to handle war-increased loads with safety; to effect real operating economies; and as a preparatory step toward building post-war domestic and industrial kilowatt-hours. General Electric engineers will be glad to help you. . . . *General Electric, Schenectady, New York.*

• *Tune in General Electric's* "The World Today" *and hear the news from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS network. On Sunday evening listen to the G-E* "All Girl Orchestra" *at 10 E.W.T. over NBC.*

77 DIFFERENT STANDARD PANEL UNITS

give G-E carrier-current equipment the highest possible flexibility — applicable in "packages" ranging from the size of a suitcase to assemblies of 24 units or more.



151-C4-6920

GENERAL ELECTRIC HAS DESIGNED AND BUILT MORE CARRIER-CURRENT EQUIPMENT THAN ALL OTHER MANUFACTURERS COMBINED.

CARRIER CURRENT

The nerve network of the power system

We Accepted a Challenge . . .

Simplex "War-Tirex" is the Result

The decision of the Office of the Rubber Director that natural rubber could no longer be used in the sheaths of rubber sheathed, flexible cords and cables came as a challenge to us to produce as good or better sheaths with synthetic rubbers. We accepted the challenge with full confidence in our ability to make the most of the available synthetic rubbers but with some doubt as to the possibility of making anything to equal the 60% natural rubber sheath used on TIREX cords and cables for so many years. Results have proved that we underestimated the possibilities.

The flexible, rubber sheaths used at present on all "War-TIREX" cords and cables contain selenium to obtain toughness and are now equivalent to the former natural rubber sheaths in wearing qualities. They are offered by us and may be bought by you with confidence that their performance will be satisfactory wherever flexible cords or cables are needed to supply power for electric tools or equipment.

In mines, quarries, shipyards, mills and factories Simplex-TIREX cords and cables are helping to keep production schedules from slowing down. A flexible cable suitable for the rough work illustrated can be depended upon to give a good account of itself under any conditions.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

ARMY E NAVY

M★★★

Simplex

WIRES and CABLES

PACIFIC COAST OFFICES

390 Fourth St., San Francisco, Calif.

910 East Third St., Los Angeles, Calif.

503 Polson Bldg., Seattle, Wash.

Hear and enjoy this brilliant new radio program

"THE ELECTRIC HOUR"

Starring

NELSON EDDY

WITH ROBERT ARMBRUSTER'S ORCHESTRA, GUEST STARS AND CHORUS

10:30 P.M., EASTERN WAR TIME

ENTIRE COLUMBIA NETWORK

• Twice voted radio's "Star of Stars," Nelson Eddy is also a screen and concert favorite with a wide following. His golden baritone, plus Robert Armbruster's 35-piece orchestra, plus a chorus and guest stars, all add up to a *popular* program packed with good music and good humor.

Woven into the entertainment are friendly, factual messages about America's *business*-managed light and power companies. They reach electric customers everywhere and will contribute to a clearer understanding of the industry's aims and accomplishments.

This grand new show extends and strengthens the continuing program of publication advertising in *The Saturday Evening Post, Collier's, Life, Time* and *Newsweek*, as well as business and farm magazines.

With an outstanding star and a talented supporting cast, "The Electric Hour" is one of the best shows on the air. Hear it yourself and ask your friends to listen. It deserves the support of the entire industry because it advances the interests of the entire industry.

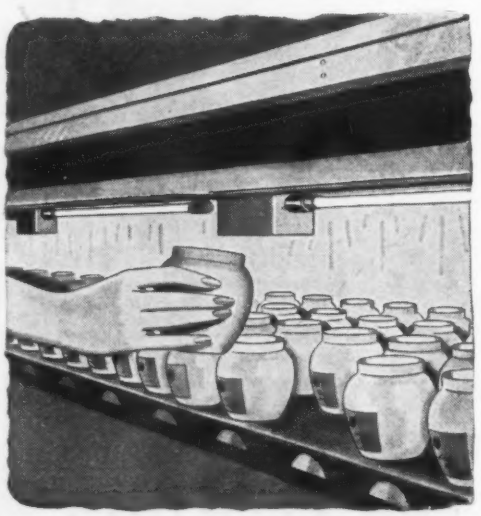
160 ELECTRIC LIGHT AND POWER COMPANIES★

SELF-SUPPORTING, TAX-PAYING BUSINESSES

★*NAMES ON REQUEST FROM THIS MAGAZINE*

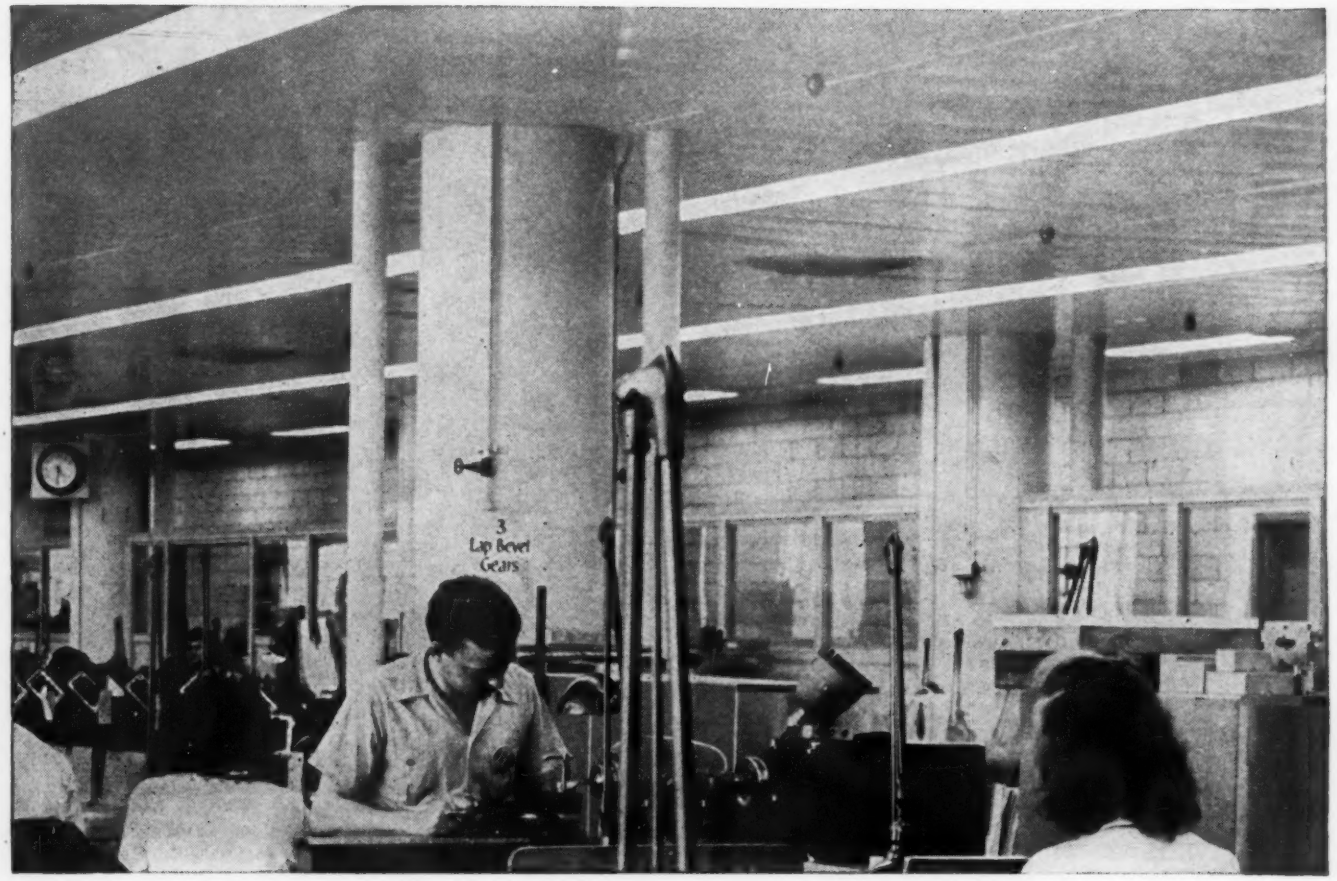
AVENUES OF LIGHT FOR WORKING EYES

TOMORROW, lamps and light will serve America in new ways, new forms, new places. Westinghouse Mazda Lamps in new shapes and colors, along with new techniques in lighting, will open up a whole new field of decoration and display for the store owner. And Westinghouse Sterilamps—already widely applied by laboratories and food and drug manufacturers to reduce contamination from air-borne bacteria — will be used in homes, schools and public buildings to lessen the risk of infection and help bring safer, more healthful living.



HELP SHORTEN THE WAR . . . BUY MORE BONDS THAN BEFORE!

WESTINGHOUSE PRESENTS JOHN CHARLES THOMAS SUNDAY 2:30 EWT., N.B.C. ★ TED MALONE • MONDAY, WEDNESDAY, FRIDAY 10:15 EWT., BLUE NETWORK



New lighting techniques developed by Westinghouse engineers, using today's high-efficiency Westinghouse Mazda Lamps, are bringing See-ability benefits to American industry. With See-ability to guide them, working eyes can operate faster, more accurately. Precision work can be done by more people, with fewer errors and less fatigue — all important factors in the huge job of arming and supplying our fighting men. And when this big job is done, today's higher lighting standards will bring See-ability benefits to peacetime factories, offices, stores and homes. Give your customers the benefit of Westinghouse research and progress in lighting, recommend bright, long-lasting Westinghouse Mazda Lamps for every lighting plan and installation. Westinghouse Electric & Manufacturing Co., Bloomfield, New Jersey.

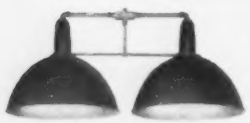
Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

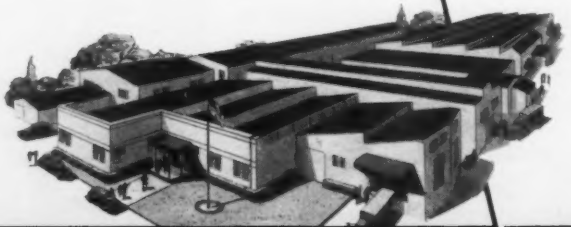
MAZDA LAMPS FOR SEE-ABILITY

This label on lighting equipment means lower maintenance expense

SMOOT-HOLMAN COMPANY
SMOOT-HOLMAN
INGLEWOOD, CALIFORNIA
MADE IN U.S.A.



The Smoot-Holman hall-mark is more than an identifying feature. It is your assurance that the lighting equipment so marked is engineered and manufactured to give longer life at a minimum of maintenance expense. Smoot-Holman users tell us that this margin of quality is apparent in the trouble-free performance that is characteristic of this equipment.



SMOOT-HOLMAN COMPANY
INGLEWOOD, CALIFORNIA
Offices in Principal Western Cities • Branch and Warehouse in San Francisco

BOOKS

you may want

MATHEMATICAL AND PHYSICAL PRINCIPLES OF ENGINEERING ANALYSIS, by Walter C. Johnson, 346 pages, 5½ x 8½, index, many illustrations, McGraw-Hill Book Co., $3.

The analysis of an engineering problem requires the assembly of necessary basic data, the knowledge of various methods of setting up equations and an understanding of the assumptions that must be made. The mechanics of arranging the elements of the equation desired is ordinarily scattered through various mathematics and physics text books. This book, however, brings to the student and engineer a treatise devoted entirely to this important subject. The first chapters discuss the basic physical principles involved, the accepted methods of setting up the desired equations, and the use of differential equations for both graphical and numerical solutions.

A knowledge of mathematics through calculus is necessary to make the book readily understandable; however, rigorous derivations are omitted, therefore the mathematics presented is not difficult. A chapter is devoted entirely to differential equations, partly as a review to acquaint the reader with this method of solution, and partly to show the principles involved to assemble a desired equation. Vector algebra is a most useful mathematical tool to the engineer and requires a thorough knowledge of complex quantities, which are reviewed briefly for the benefit of the reader.

It is most important to be able to properly check an equation for its physical proportions, and dimensional analysis is particularly suited for such a task. Considerable material is devoted to this subject, which will become increasingly valuable to the engineer as its possibilities become better known.

The material within this book is well arranged; many problems, exercises and examples are given, making it useful to all engaged in engineering work.—F.S.B.

BASIC MATHEMATICS FOR ENGINEERS, by Paul G. Andres, Hugh J. Miser and Haim Reingold, 726 pages, index, appendix, many illustrations, 6 x 8¾, John Wiley and Sons, $4.

Mathematics is a most important tool used by all engineers and is a subject that must be thoroughly mastered. Many have not had the chance to obtain a college education; for those individuals, this book fills a definite need, as the material is presented in an elementary but logical manner, beginning with arithmetic and ending with the elements of calculus. The text is also written in an advanced style, using much of the nomenclature of college books, thereby bridging the gap that exists between the elementary and advanced text books.

The book begins with the theory of numbers, laws of signs, fractions, algebraic additions and subtractions. The use of the slide and its accuracy is shown, the text continues with equations, graphs, variations, angles, curves, vector relations, complex quantities. Logarithms are carefully explained, the elements of plane and spherical trigonometry, analytic geometry, determinants, differential and integral calculus are given. The book carries the student through

(Continued on Page 16)

KNOCK-OUT
by Pass & Seymour
POCKET-SIZE MINE

★ Pocket-size, but powerful enough to knock out the heaviest enemy tank—a multi-purpose weapon developed by the engineers of Pass & Seymour in cooperation with the Onondaga Pottery Company and Army Ordnance.

★ A soldier can carry a number of these powerful destructive mines. Smaller and lighter in proportion to power than any weapon heretofore produced, this mine contains *a new type firing means* also designed and produced by Pass & Seymour. And thanks to the skill and precision of our workers, it has Sure-Fire effectiveness against enemy machines and installations. For two years our three plants have been working on this new weapon, also on fuzes for the recently announced non-metallic mine.

★ In addition, our production of electrical wiring devices has been expanded to meet the demands of Army Engineers and the Navy. A large share of the warships, submarines and landing craft built for the Navy program are provided with new Pass & Seymour products made to Navy specifications.

PRECISION-MADE WIRING DEVICES

The experience gained in the manufacture of special wartime products will be reflected in the many advancements that will distinguish the post-war design of Pass & Seymour electrical equipment.

Consult the P&S Wiring Device Catalog for your requirements — send for an up-to-date copy today.

P&S

PASS & SEYMOUR, INC. SYRACUSE 9, NEW YORK

No. 7 of a series published by SYLVANIA for users of fluorescent lighting

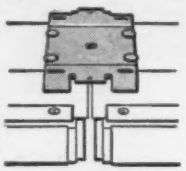
Fluorescent operating hints

METHODS OF MOUNTING FLUORESCENT FIXTURES

It's a good idea to be sure that the fluorescent fixtures you buy will be adaptable to the type of hanging necessary for your installation. Below are shown and described nine typical mounting methods.

SURFACE MOUNTING

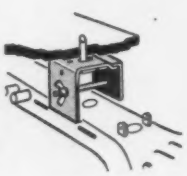
Most commercial fixtures can be bolted to ceiling mounting plates, Fig. 1, which are screwed to wood ceilings or toggle-bolted to plaster. Surface mounting is most popular where ceilings are low or unobstructed by pipes, beams, etc. Otherwise pendant mounting is used. (Note: Industrial type fixtures can be surface-mounted by using slide-grip hangers, Fig. 2, which are described under pendant mounting.)



(Fig. 1)

Surface Mounting With Slide Grip

Slide-grip hanger, Fig. 2, is fastened to ceiling with bolt or lag screw. It grips the lengthwise grooves in the top-housing at almost any point.



(Fig. 2)

PENDANT MOUNTING

There are two basic methods of pendant mounting:

(a) The supporting chain, Fig. 3, or conduit, Fig. 4, is fastened directly to the top-housing. Advantage: low cost. Disadvantage: if obstructions at the ceiling prevent a straight run of chain or conduit from fixture to ceiling, the fixture must be moved until a clear position is reached. This may not be the best position for lighting the work.

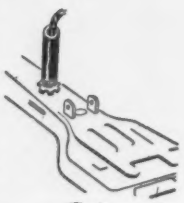
Direct with Chain Suspension

The chain from the ceiling is fastened with S-hooks to the pair of hanging-brackets at each end of the top-housing.

(Fig. 3)

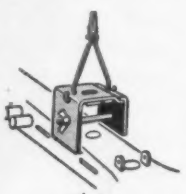
Direct with Conduit Suspension

Threaded conduit with lock nuts is fastened to ceiling beam or outlet box. The other end enters the top-housing through knock-outs. Ornamental canopies are sometimes used at the ceiling end of the conduit.



(Fig. 4)

(b) To overcome ceiling obstructions, the top-housing of some fixtures is grooved on both sides to accommodate a pair of metal clamps, which can be fastened at almost any point along the grooves. Then the hanging device (chain, etc.) is fastened to the clamp. This permits the hanging device to be fastened at the most practical point on the ceiling and permits the fixture to be placed at, or close to, the best point for illumination. Various methods of using these slide-grip hangers are shown below.



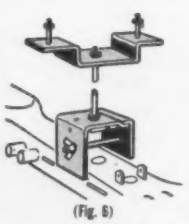
(Fig. 5)

Slide-grip with Chain

S-hooks fasten the chain to the slide-grip. Fig. 5.

Slide-grip with Rod and Ceiling Aligner Bar

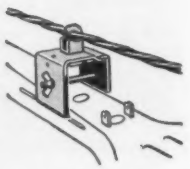
A threaded 5/16"-diameter rod is fastened to the slide-grip with a nut, Fig. 6. At the ceiling, a U-shaped ceiling aligner bar is fastened with lag screws or expansion bolts. The free end of the rod is fastened to the aligner bar with a nut. This insures accurate vertical and horizontal alignment of rows of fixtures.



(Fig. 6)

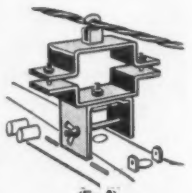
Slide-grip with Messenger Cable

Instead of vertical supports, messenger cable parallel to the floor may be used to support fixtures, Fig. 7. Slide-grip hangers can be supplied with a cable clamp for mounting the fixture in line with, or at 90° to, the cable.



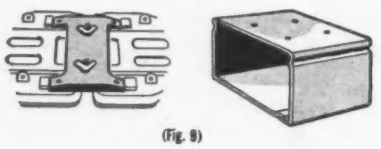
(Fig. 7)

To offset sagging in the cable, the cable-clamp is bolted to an inverted ceiling aligner bar, Fig. 8. This bar is bolted to another, which in turn is bolted to the slide-grip. Drawing up the bolts that join the two aligner bars permits the fixture to be made level with others in same row.



(Fig. 8)

CONTINUOUS ROW MOUNTING



(Fig. 9)

Where continuous rows of fixtures are desired, individual fixtures may be joined along the top-housing with joining straps, Fig. 9, which also provide continuous wireway enclosures. End plates are used at the ends of each row.

ADAPTABILITY IS IMPORTANT

Sylvania Industrial Fluorescent Fixtures are designed so that they can be mounted by *any* of the methods described above. This makes them fully adaptable to all conditions in your plant and permits reuse if remodeling alters ceiling layout.

One Standard—The Highest Anywhere Known

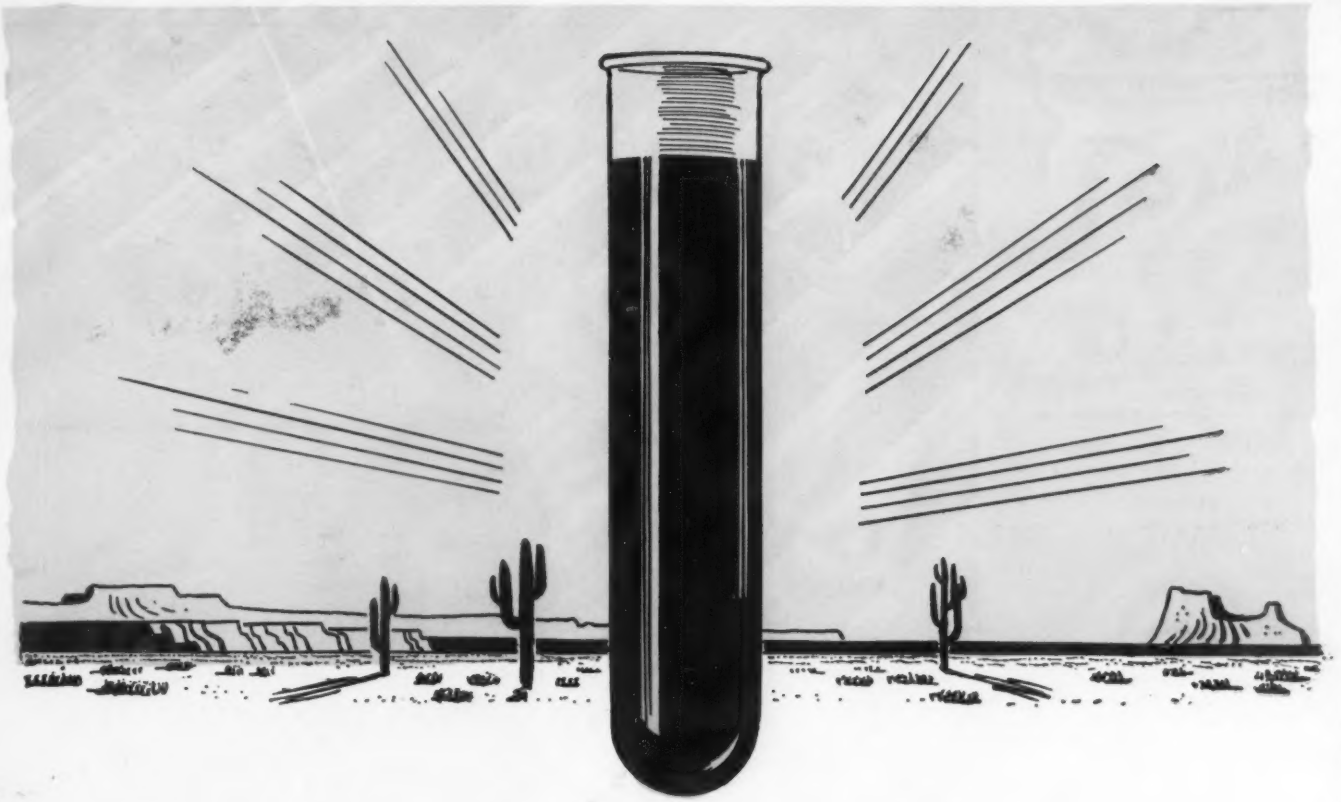
SYLVANIA ELECTRIC PRODUCTS INC.

555 So. Flower Street, Los Angeles 13, Calif. • 111 Sutter Street, San Francisco 4, Calif. • 4424 White-Henry-Stuart Bldg., Seattle 1, Wash.

FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, INCANDESCENT LAMPS, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES

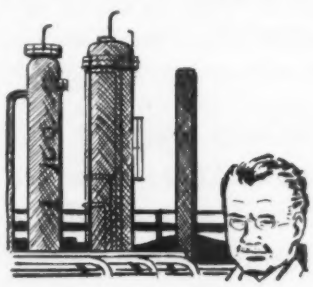
For Additional Fixture Data, Send For The Free Booklet:

"How to Solve Your Industrial General Lighting Problems with Fluorescent at Its Finest"



Why transformers need dry oil

Water in a transformer oil forms a perfect avenue of escape for the electric potential the oil is expected to guard. Since most oils contain water to some degree, it is only by the most careful refining and handling that moisture is sufficiently



excluded from transformer oil to guarantee proper insulation.

Its hundreds of successful applications prove that with Red Line Transformer Oil this care has been taken. Furthermore, extreme precautions are used to keep out lint and other foreign substances which also lower the dielectric strength of oils.

Red Line Transformer Oil has unusual stability, as indicated by its high Snyder Life Test. With proper care, it can be used for many years. Its low viscosity means better and faster cooling.

Red Line Transformer Oil is the result of more than a quarter of a century's experience in the manufacture of transformer oils.

Union Oil chemists have always worked closely with the principal manufacturers of transformers in order to better serve the needs of the electrical industry.

You can get a supply by phoning your local Union Oil Company representative. He'll be glad to give you additional information on electric motor greases or any of the 492 quality petroleum products Union Oil manufactures. Call him today.

RED LINE
TRANSFORMER OIL

ALABAMA
Birmingham—McConnell Sales & Engineering Corp.

CALIFORNIA
Los Angeles—E. M. Ornitz
San Francisco—W. S. Wetenhall Co.

COLORADO
Denver—Mine & Smelter Supply Co.

DISTRICT OF COLUMBIA
Washington—Meleney Engineering Co.

GEORGIA
Atlanta—Evans L. Shuff

INDIANA
Indianapolis—Hugh J. Baker & Co.
South Bend—Edwards Iron Works, Inc.

IOWA
Des Moines—Delevan Engineering Co.

LOUISIANA
New Orleans—Arthur C. Hays

MARYLAND
Baltimore—H. T. Potts Co.

MASSACHUSETTS
Boston—Brown-Wales Co.
Holyoke—Massachusetts Supply Corp.

MICHIGAN
Detroit—Wm. P. Favorite

MINNESOTA
St. Paul—Robert J. Wylie

MISSOURI
Kansas City—W. R. Fithian
St. Louis—Rhodes Equipment Co.

NEW JERSEY
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NEW YORK
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Buffalo—Reecon Company, Inc.
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OHIO
Cincinnati—Wyman Engineering
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Fairmont—Fairmont Mining Mach. Co.

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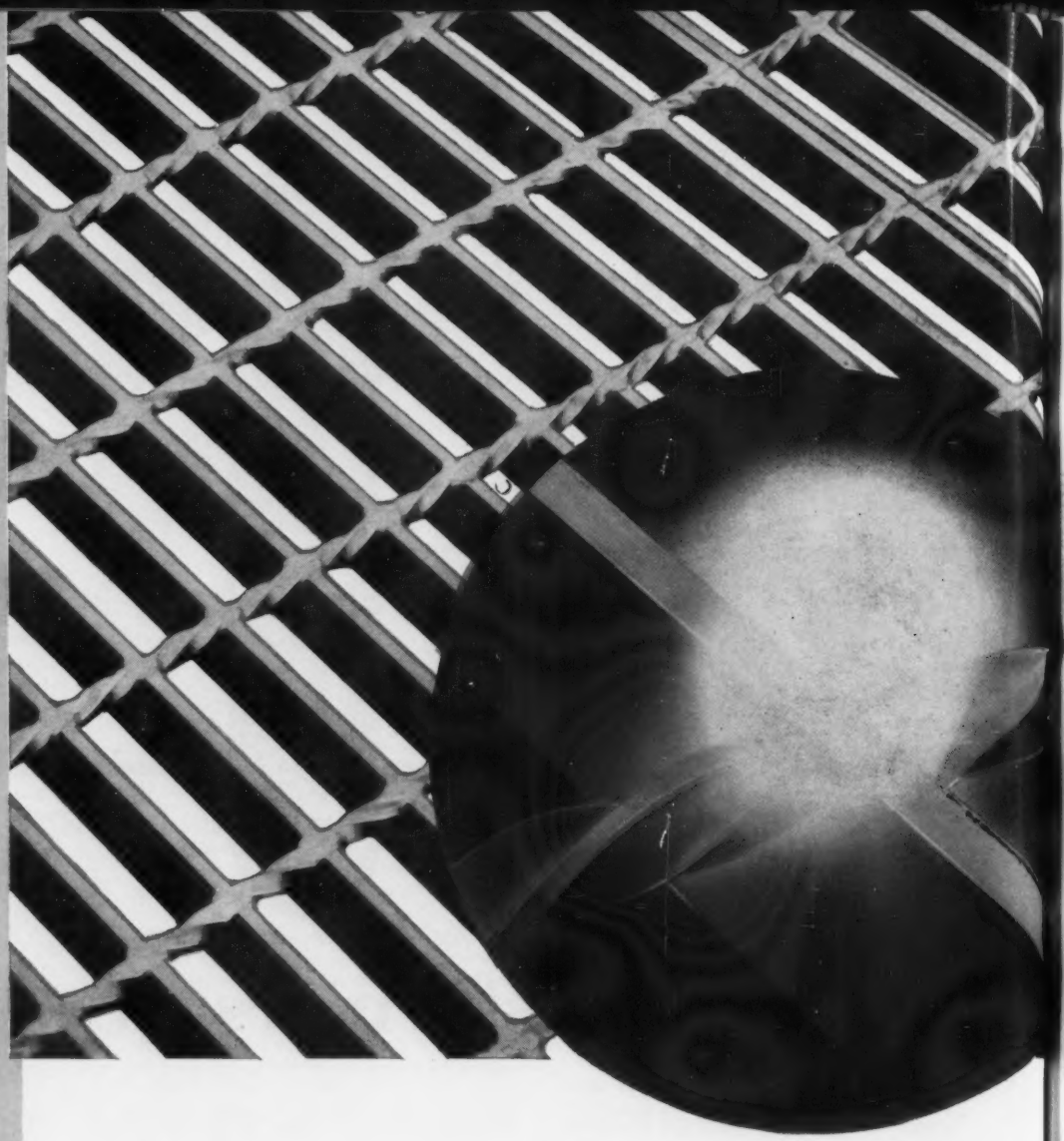

No Overhead Under-Foot

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has proven itself to be a "one time" investment. With the exception of an occasional painting, there is no overhead for repair or replacement to this solid, one-piece grating. It's better 5 ways . . .

1 — Self-cleaning, no sharp corners to clog
2 — Maximum open area for light and air
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4 — Strong electroforged construction means easy erection
5 — Safe footing at all times with twisted cross bar

A Catalogue and paper weight size sample will be sent upon request made on a firm letterhead.

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OF BLAW-KNOX COMPANY
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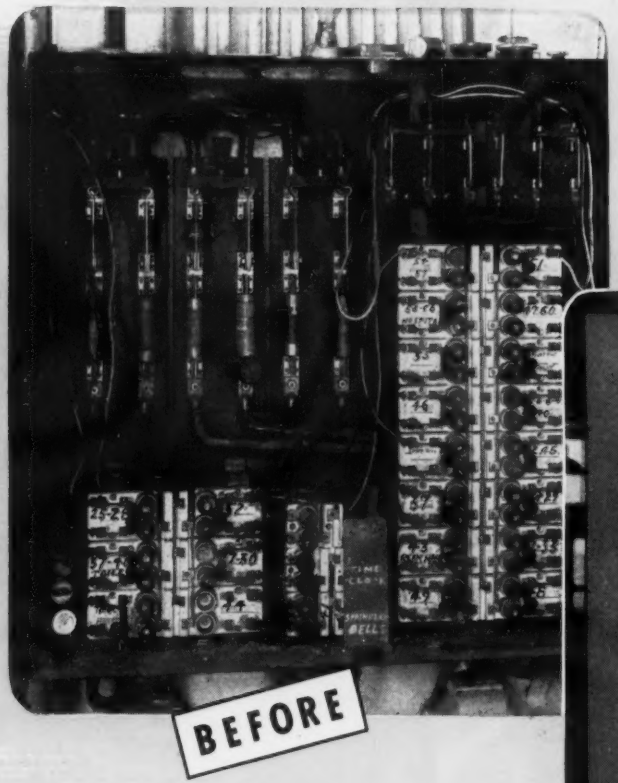
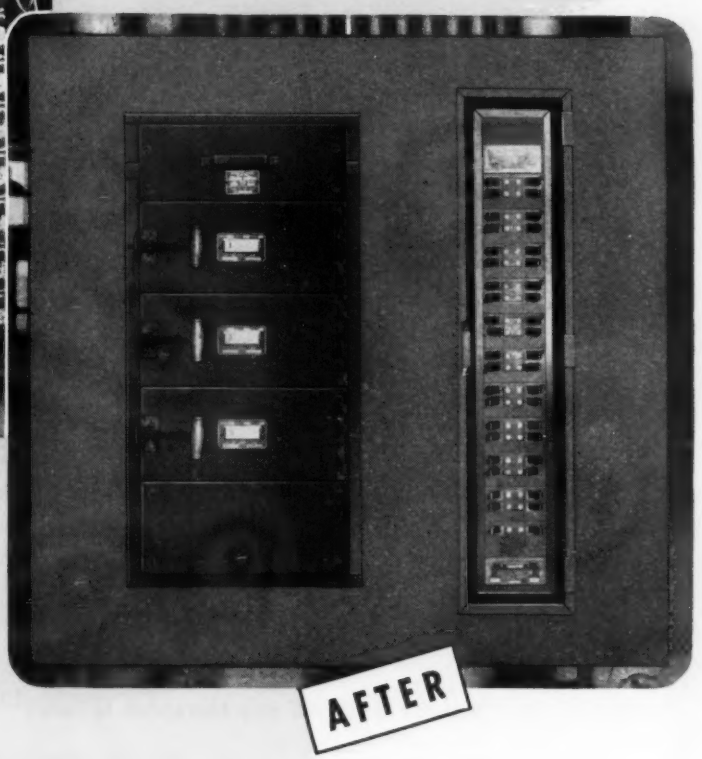
Representatives in Principal Cities

No Plant Too Large *or too small* To Profit by this SQUARE D *Conversion Plan!*





● Panelboards, taxed beyond their efficient capacities, are a drain on the productivity of any plant — regardless of its size. This speedy Conversion Plan involves such a moderate investment that it "pays off" in a hurry, even in the smallest plant.

The pictures above show a typical conversion. With a minimum of time and labor and at no increase in space, 25 lighting circuits were increased to 42—up 68%. Circuit breaker convenience and protection replaced obsoleted fusible circuits. Notice, too, that Saflex units were installed for the main controls, with sufficient space provided for an additional circuit, if and when it is needed.

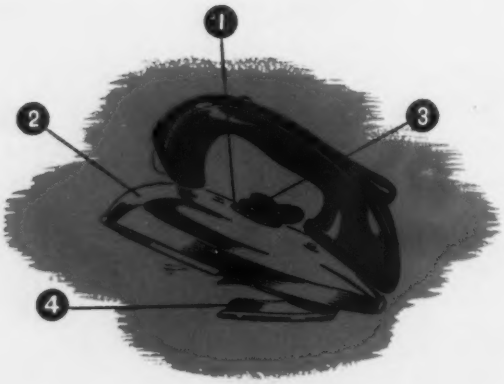
Remember, such conversions as these utilize existing boxes and conduit. The cost in time and money is small. The dividends in conserved power and increased efficiency are substantial. Your nearby Square D Field Engineer will be glad to analyze your present equipment and submit a tailor-made conversion plan for your consideration. This service costs nothing—pays big dividends.

Write for a free copy of "MORE CAPACITY" which shows a variety of conversions in detail. Address Square D Company, 1318 East 16th Street, Los Angeles 21, California.

SQUARE D COMPANY

LOS ANGELES • DETROIT • MILWAUKEE

If you sold PROCTOR NEVER-LIFT SPEED IRONS before the war...



...your sales talk *MADE NEWS* with these PROCTOR "firsts":

1. (1929) First Fabric Dial
2. (1934) First Pressure-Sealed element
3. (1939) First Speed Selector
4. (1939) First *and only* Never-Lift feature!

TOMORROW...

...You'll make news again with the still finer Never-Lift iron coming from Proctor after the war. Meanwhile let's all *"Back the Attack"* with War Bonds.

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the entire range of the usual engineering mathematics.

The material is particularly well arranged, the symbols are clearly designated, many examples pertaining to engineering problems are presented and their solutions given. Other problems are given for the students to solve. The appendix reviews geometry and includes tables of squares and of roots, trigonometric functions, logarithms, symbols and units.—F.S.B.

FIELDS AND WAVES IN MODERN RADIO, by Simon Ramo and John R. Whinnery, 502 pages, 6x8¾, John Wiley and Sons, $5.

The increasing use of ultra-high frequency equipment has focused much attention on the theory of electro-magnetic waves and fields. Maxwell's equations are now a vigorous working tool in the hands of engineers designing such installations, while only a few years ago these equations were more of an academic interest.

The production of ultra-high frequency equipments with their currents and fields has necessitated an intensive study of a practical nature of physical dimensions of wave guides and terminal arrangements. This book is particularly valuable to those individuals studying the theory necessary to properly apply such waves and fields to commercial equipment.

The first part of the book brings the reader through the necessary mathematical background and the equations required to develop the theory of oscillation and wave fundamentals, the equations of stationary electric and magnetic fields, Maxwell's equations and high-frequency potential concepts, circuit concepts, and their validity at high frequency.

The latter part of the text develops the propagation and reflection of electro-magnetic waves, guided electro-magnetic waves, characteristics of wave guides and transmission lines, resonant cavities and radiation.

This book is valuable to all working in this field who must acquire a basic foundation for the application of high-frequency wave and field theory. The material is well arranged and a knowledge of mathematics through college calculus is advisable to obtain the maximum benefit from the text. —F.S.B.

THE POWER FACTOR PROBLEM, 32 pages, 8½ x 11, tables, diagrams and charts, U. S. Department of the Interior, Bonneville Power Administration, Portland, Ore.

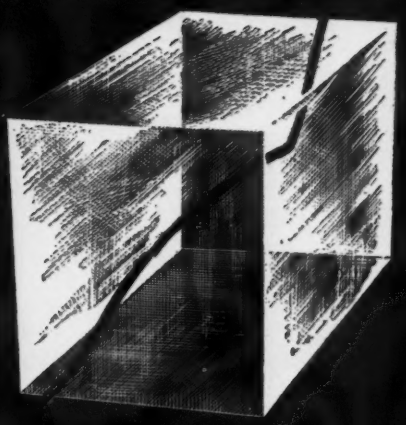
A booklet got out by the System Development Section, Branch of Power Management of the Bonneville Power Administration, dealing with the fundamentals of power factor and reactive component of power for the benefit of those who are not familiar with the basic principles of alternating-currents and magnetism. Application of corrective equipment and methods of computation are given in some detail.—W.C.H.

CONTROL OF ELECTRIC MOTORS, by P. B. Harwood, 479 pages, 6 x 9, index, illustrated, John Wiley & Sons, $5.

This second edition brings up to date this popular text. Additional data on variable-voltage control, single-phase motor control, synchronous motor control, present-day methods and devices for acceleration, and systems for main rolling mill drive are included. A complete new chapter has been added on synchronous motor control and another on variable-voltage control to supply

(Continued on Page 20)

Laytex Proved Even Better Than We Knew!



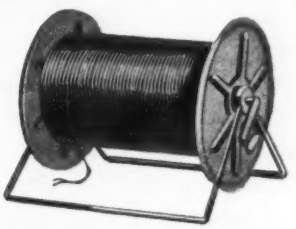
We knew that Laytex-insulated wire was good. But actually, *no one* expected any single wire to stand up to all the tough war-usage that Laytex did.

Laytex has taken arctic cold, tropic heat, moisture, mold, shock and wear, as no other wire has ever done heretofore. It has been used for virtually every purpose a wire can be used for—action-tested all over the world—and has come out with flying colors.

Laytex has a proven record of delivering *more* electricity, *more* dependably, in *more* jobs than any other wire we know.

Right now the entire output of Laytex Wires and Cables is going to the Armed Forces. But the day is steadily drawing nearer when manufacture will be resumed for Buildings, Police and Fire Alarms, Communications, Signalling, Power, Control, and other exacting services.

RUBBER INSULATION AT ITS BEST



U.S. Laytex

Reg. U. S. Trade Mark

WIRES AND CABLES

SERVING THROUGH SCIENCE TO PIONEER A NEW ELECTRICAL ERA

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

Electric power for farms is no longer a mere convenience or luxury; it has become a necessity. It took the war to drive home this point—for the manpower shortage became so acute that farm production was curtailed by lack of help.

One answer to this critical problem was expanded electrification—and Bethlehem was ready with Ruralductor. Years before the war, Bethlehem had been developing this rugged steel conductor for use in farm-electrification programs.

Each of the wires in Ruralductor is coated with zinc—a uniform, ductile covering that protects against corrosion. The zinc coating is 99.9 per cent pure; is applied electrolytically by Bethlehem's exclusive bethanizing process, and is available in A, B, and C weights.

Where Ruralductor Is Practical

Ruralductor finds its greatest field in layouts where secondary feeders and tap mileage predominate . . . hence it is highly suitable and economical for much of the rural mileage yet to be built. Its electrical capacity, while less than that of the non-ferrous conductors, is adequate for the purpose. Moreover, as Ruralductor is made of steel, it has the strength required for safe use on longer spans — *with consequent reduction in the number of pole structures needed.*

During the war emergency, Ruralductor has been pressed into service in primary feeder lines. Although its performance there has surpassed expectations, it is not generally recommended for that type of use.

Planning for Postwar Expansion?

Most utility companies and electrical engineers are already looking ahead to the postwar era. To these planners we offer a suggestion: talk to a Bethlehem representative about the numerous advantages of bethanized Ruralductor. They are advantages that will reduce both installation and maintenance costs; that will assure long-range economy.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ BETHLEHEM STEEL ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Let Hotpoint Help You Keep Customers Happy

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YOU know how important it is to keep customers' equipment in service during this emergency. The operation of Hotpoint major appliances is essential to the public welfare. Hotpoint recognizes its responsibility and is (1) making every effort to provide functional repair parts when needed, and (2) providing service information and help that can be very useful to you.

As to the use of our service helps, that is up to you. They are yours for the asking. Just call or write your Hotpoint distributor so you will receive our *Servicegrams, Parts Catalogs* and other helps that are available. And if you don't have the free *Service Guides* shown here, be sure to ask for them. Pocket size, they show by cut-away sections and simple explanations how to keep your customers' Hotpoint appliances working satisfactorily, through the emergency.

Teamwork means everything these days. For the sake of your business future, we are sure you are willing to do your part — and to use any help we can furnish. We make our pledge that Hotpoint will continue to give real meaning to the word "service."

Edison General Electric Appliance Company, Inc.
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FOR SERVICE REPAIRMEN
Hotpoint Electric RANGE
Hotpoint Electric WATER HEATER
Hotpoint Electric KITCHEN SANITATION EQUIPMENT
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FOR EXCELLENCE IN WAR PRODUCTION

ELECTRIC **Hotpoint** KITCHENS

REFRIGERATORS • RANGES • WATER HEATERS • WASHERS AND IRONERS • CLOTHES DRYERS • AUTOMATIC DISHWASHERS • ELECTRASINK • STEEL CABINETS

KLEINS

FOR YOUR PROPOSED EXPANSION

Plans of public utility companies call for a large increase in power lines, communication lines and transport facilities as soon as war conditions permit the release of material and manpower.

For whatever plans you are making, be sure to include Klein tools and equipment to aid your men to do better work —to do it faster—to guard their safety.

The name Klein has stood for the finest in tools and equipment for linemen since the first wires were strung. As advanced technology has demanded new tools, the Klein line has kept pace. As soon as the war ends, Klein equipment will be available, representing tops in quality as it has "since 1857."

ASK YOUR SUPPLIER

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This book on the care and safe use of tools will be sent without charge upon request

Since 1857

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the great demand for complete information in these important subjects. Many new tables, giving motor and controller ratings, also have been included. At the same time a more convenient arrangement of subject matter has been effected.—W. C. H.

W. F. Durand Anniversary Volume, 106 pages and bibliography, 9 x 11, published by the Durand Reprinting Committee, c/o California Institute of Technology, Pasadena, Calif. Copies now available at $2.50 each. The volume contains *An Appreciation*, by Frank B. Jewett on the occasion of the eighty-fifth birthday of William Frederick Durand; a biographical sketch by Elliott G. Reid; seventeen selected papers of Professor Durand, and a bibliography of his published works.—W. C. H.

PRODUCTS

that are news

Welding Timer (1000)

General Electric has announced a new precise electronic forge-pressure timer in its line of capacity discharge controls for resistance welding machines. The timer is designed for dual pressure spot welding machines of the capacitor discharge type and, according to the manufacturer, functions to supply accurately timed forge-pressure so that the required welding energy, cracks, indentations and sheet separation are reduced.

This unit is calibrated in milliseconds and consists of a timing circuit with a regulated d-c source of voltage; necessary electronic tubes; a time-delay relay with fixed timing for compensating for the delay in the operation of the solenoid valve on the welding machine to allow the forge-pressure to be applied precisely at any point during the current discharge.

Expansion Fitting (1001)

An expansion fitting claimed to be patterned on a new design has been announced by the O. Z. Electrical Mfg. Co. The new fitting is said to be shorter and more compact than previous types and to require fewer parts. The standard finish is cadmium plated but a bronze finish can be secured. The head is sealed by a special packing to keep out water or moisture and is recommended by the manufacturer for use on bridges, tunnels, dams or other construction where long lines of conduit must be installed.

Frequency Meter (1002)

J-B-T Instruments has a new miniature frequency meter, which is said to be more compact than previous models and to make frequency measurement available for air borne units portable equipment and miniature panel boards. Designated as 21-FX, the new unit supersedes the company's 21-F model.

Welding Electrodes (1003)

Allis-Chalmers Mfg. Co. has a new line of arc welding electrodes, a-c and d-c types. These electrodes use the standard American Welding Society number and color and are said to have quiet arc characteristics.

Aluminum cuts costs by taking the *Grunt* out of labor

Weight-saving aluminum reduces the labor that has to be expended to do a job. Equipment manufacturers and employers are finding it increasingly important to bear this fact in mind.

The lighter weight of Aluminum Cable Steel Reinforced means that full reels weigh less. Handling from storeroom to the job is easier. With A.C.S.R., there's less weight to be maneuvered into place on poles and towers, so that work goes faster. Lines cost less.

The lighter weight of aluminum bus bars, housings, conduit, Alzak* Aluminum light reflectors, offers identical advantages; easier delivery to the job, faster erection, and lower costs all along the line. Doubtless, many electrical devices could similarly be made labor savers by cutting their weight.

Winning the war comes first, but aluminum is now being used for other-than-war purposes as the manpower situation permits. Our representative will be glad to discuss the availability of aluminum with you. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh 19, Pa.

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ALCOA A·C·S·R

ALUMINUM CABLE STEEL REINFORCED

ALCOA ALUMINUM

FOR CLOSER SCHEDULING OF POWER FLOW

consider carrier communication!

For interconnected systems serving heavy wartime loads, demands on voice communication facilities are vastly increased. Immediate communication between dispatchers' offices on neighboring lines is a *must*—to permit close scheduling of power flow, and make available maximum generating facilities to meet major variations in load.

At the same time, regular telephone circuits are greatly overloaded. Additional lines cannot be constructed. Therefore, use of carrier channels for voice communication is a most practical solution.

Westinghouse carrier communication equipment is simple to install. It is reliable, low in cost, uses a minimum of critical materials. Your Westinghouse office can give you full information and engineering assistance. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. J-97088

ONLY THESE BASIC ELEMENTS ARE REQUIRED

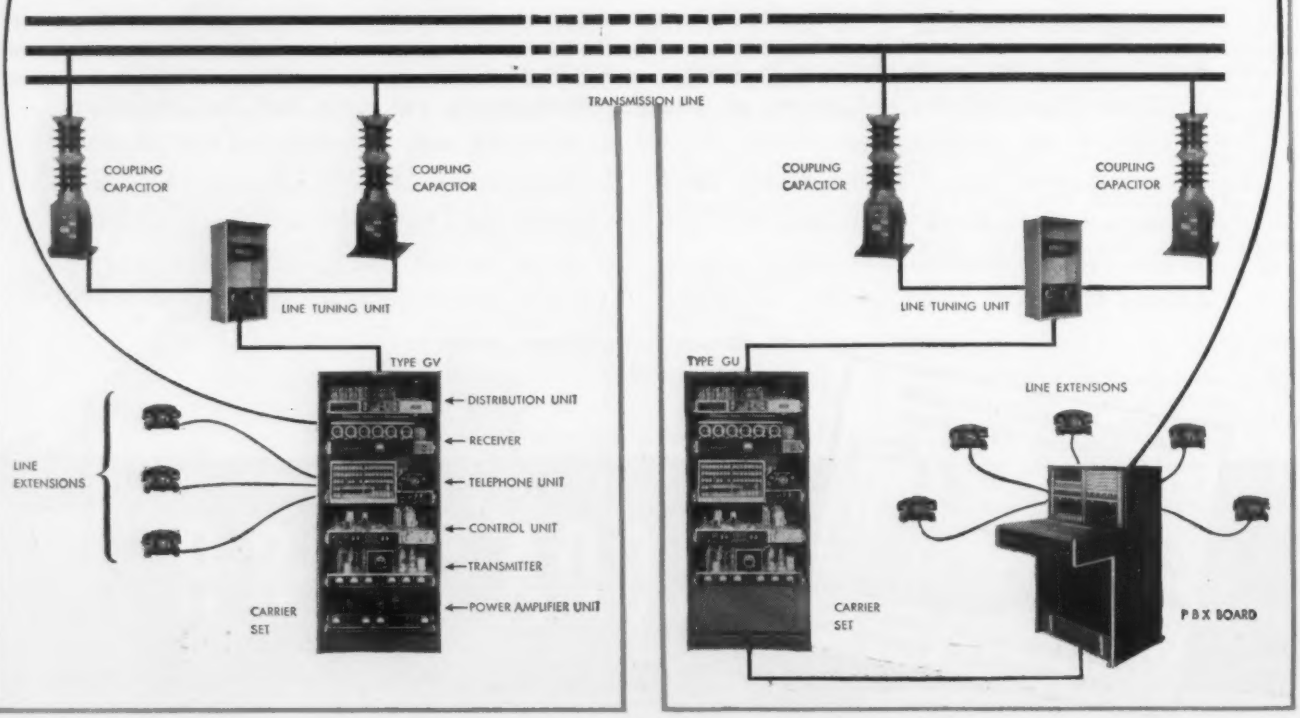
Carrier Set—includes Transmitter, Receiver, Power Supply and Telephone Equipment. Preferred service gives dispatcher use of channel at any time. Others are locked out.

Line Tuning Unit—whose inductive reactance neutralizes the capacitive reactance of the coupling capacitor.

Coupling Capacitors—provide a path through which carrier flows into or out of the line.

Line Extensions—as many as 10 line extensions may be selectively called. One or more extensions may be 10 or 15 miles long. Automatic compensation is provided so short line as well as long line voice levels are the same.

PBX Board—one or more of the 10 extensions from the Carrier Set may be to PBX Boards for further extensions, or to other carrier channels.

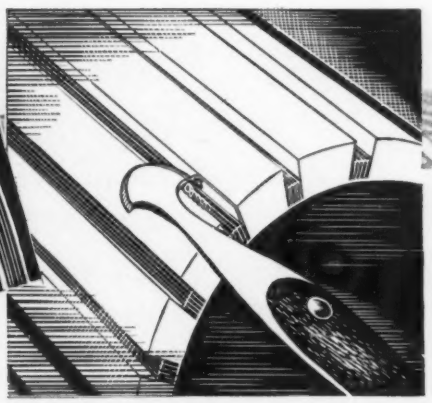


The ABC of Good Commutation and Electrical Machine Performance

● Serious shutdowns and consequent delays in the production and delivery of urgently needed materials can be avoided by observing these simple precautions in the maintenance of motors, generators and converters. Under present conditions, dependable and uninterrupted performance of electrical power equipment is of utmost importance. Keep your machines in readiness to deliver full output at all times.

Keep Commutators and Rings Clean

Cleanliness is of paramount importance in the continuous operation of brush-using equipment. Time spent on keeping commutators, rings, brush holders and rigging free from dust, dirt, oil and film pays dividends. Use a suitable canvas wiper frequently on commutators and rings. Keep them clean and keep them running.



Keep Undercut Commutators Free from Side Mica

Thin edges of mica along the sides of slots of undercut commutators are a frequent source of trouble. Special care should be taken to inspect each slot carefully and to remove all side mica when undercutting commutators. Bad sparking and serious commutator burning can be avoided by observing this precaution.

Keep Brush Pressure Uniform and Correct

The spring pressure applied to brushes has a marked influence on brush performance. Equal distribution of current among all brushes requires that the pressure on all brushes be kept as nearly equal as possible. Check brush pressure frequently and adjust it to compensate for brush wear. Use pressures recommended for the grade of brush and class of service in which it is used.

MODERN PYRAMIDS will tell you more

This series of bulletins contains practical information on Commutation, Brush Operation and Machine Maintenance to help conserve present equipment and to keep it in continuous and efficient operation. If you are not receiving these bulletins write us direct or contact your National Carbon representative.

The services of our engineering staff are available for the proper selection and application of "National" Carbon Brushes on all types of equipment and for every class of service.

Keep your eye on the infantry . . . the doughboy does it!

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NORGE Offers You the PROFITS and EXTRA SALES of a Complete Line of Major Home Appliances

EVERY SUCCESSFUL DEALER KNOWS—

One outstanding appliance will sell others of the same brand. A family pleased with a Norge Rollator refrigerator is a ready prospect for a Norge range. It's basic appliance selling!

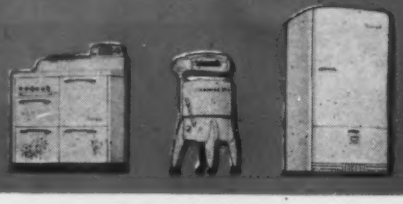
And that's why Norge dealers will enjoy *profits* from *extra sales.* Norge will give them a *complete* line of brilliant major home appliances under one famous name. And in addition to the quality line of Rollator Refrigerators, Gas and Electric Ranges, Washers and Home Heaters, Norge will offer new pace-setters in postwar profit-makers for Norge dealers to present to America's waiting homemakers . . . all the opportunities for a great future.

Norge means new products for waiting home owners to buy. Norge means new products for far-thinking dealers' profit. Norge means a *successful future* for Norge dealers!

Norge Division, Borg-Warner Corporation
Detroit 26, Michigan

A BORG-WARNER INDUSTRY

BETTER PRODUCTS FOR A BETTER WORLD



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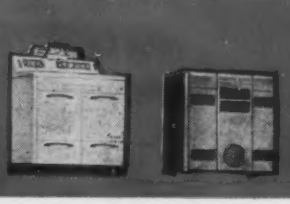
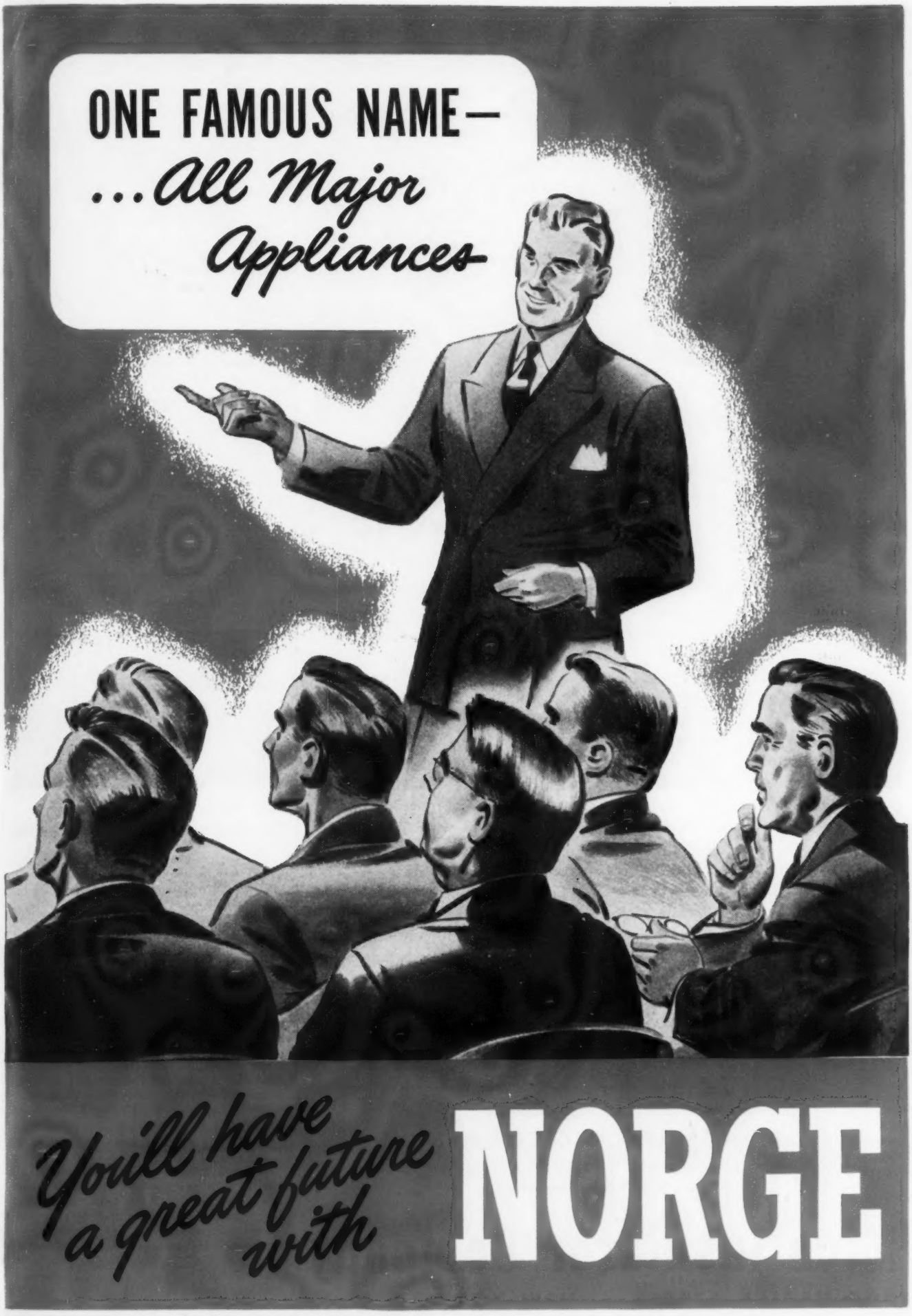
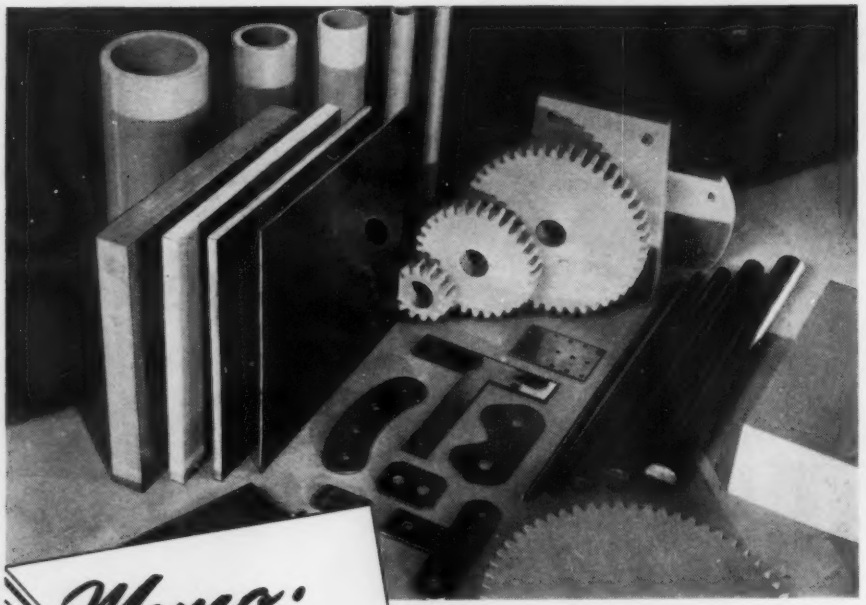
NORGE

BEFORE YOU BUY



"...for outstanding production of war material."


ONE FAMOUS NAME—
...All Major Appliances
You'll have a great future with
NORGE



Memo:
to a Manufacturer Who has not yet Used

LAMICOID

When specifications call for a plastic laminate which will meet requirements ranging from battleship switchboard panels to finely fabricated parts...experienced buyers call for LAMICOID!

LAMICOID, a thermosetting plastic laminate in sheet, rod or tube form, may be sawed, sheared and punched, or machined into intricate parts of extremely close tolerance. It is moisture-resistant, lighter than most woods or metals, yet has a high degree of tensile and flexural strength which makes it superior to either material for countless applications. LAMICOID is resistant to corrosive chemicals and impervious to many of them. Since it is made with a wide selection of base materials—including asbestos paper, Fiberglas, linen canvas, and assorted papers—it is available in grades suited to either high or low voltage applications. It has excellent dielectric strength, showing low losses even in the presence of high humidities. In short, LAMICOID is an electrical manufacturing material of sufficient importance and versatility as to warrant your early investigation.

Triangle-Pacific Company, west coast representatives of Mica Insulator Company, stock LAMICOID in all standard grades, colors and sizes... and offer quick, convenient fabrication facilities for western industries. Their experienced counsel is at your disposal without obligation.

West Coast Sales Representatives

TRIANGLE-PACIFIC COMPANY

SAN FRANCISCO: 1045 Bryant Street LOS ANGELES: 340 Azusa Street

SEATTLE: 95 Connecticut Street

Mica Insulator Company

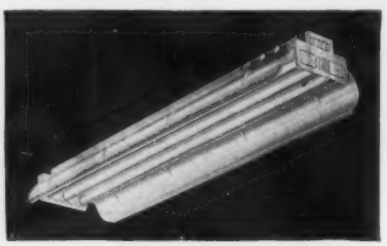
200 VARICK STREET · NEW YORK 14, N. Y.

Electric Furnace (1004)

An electric furnace providing temperatures up to 1,850°, is being manufactured by the Thermo Electric Mfg. Co. for heat treating tools and dies in machine shops and for general industrial and laboratory use. According to the announcement, the furnace has a heavy steel, welded frame with transite sides and 4¾ in. of insulation around the heating chamber. The front of the furnace is of heavy steel plate, with an instrument panel built into the base. The door is supported by two sets of parallel levers and when opened moves upward and out of the way. Heat selection is provided by an input controller, mounted on the instrument panel and designed to turn the current on and off automatically for any portion of a one-minute cycle. The instrument panel also contains an indicating pyrometer calibrated to 2,000° F., a pilot light and switch. The unit is 21 in. wide, 31 in. high and 18 in. deep. Heating chamber is 5½ in. wide, 4½ in. high and 10½ in. deep. It is built for operation on either 115 or 230 volts and is rated at 2,000 watts.

F Unit (1005)

Following release of heavy-gauge steel for lighting fixtures, the Edwin L. Guth Co. has announced a new fluorescent unit, the Mazelite, for industrial use. This reflector is available with either porcelain enamel (1,200°) or with synthetic enamel (300°) surface. Reflector ends are rounded. This unit is for use with two 40-watt, three 40-watt or two 100-watt lamps. It can be had with hot or cold cathode auxiliaries.



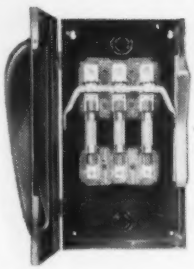
Oil Heating Unit (1006)

To provide heat transfer oil to machines which require elevated temperatures, an oil heating unit, Model S-12, has been designed by Youngstown Miller Co. According to the manufacturer, a typical model has 12.8 kw. of electric heaters applied externally to the heating portion of the tanks and capacity for 12 gal. of oil. Three thermostats, each of which may be set for a desired temperature, are provided. A selector switch permits changing the controlled temperature from one to another by putting either of the thermostats into the electric circuit.

The heated oil is circulated by a rotary pump driven by a ½-hp., 1,150-rpm. direct connected motor and the pump is said to be so located that drip from the stuffing box returns to the main circulating oil pool.

Meter Insulation (1007)

Sangamo Electric Co. has announced that it will use a new insulation material around the terminals in all its watt-hour meters. This material, mineral-filled Melmac, is a melamine-formaldehyde plastic molding, and is produced by the plastics division of American Cyanamid Co. Sangamo states that it is believed that the material will practically eliminate terminal block failures resulting from surges or arc-tracking.



Vacu-Break SAFETY SWITCHES WITH "CLAMPMATIC" CONTACTS

Even if we wished, we could not meet the nation's total demand for Safety Switches . . . But it is gratifying to realize that we are attracting the greater part of the business placed by users who insist on highest quality.

This they get in BullDog with its exclusive Vacu-Break principle of arc suffocation . . . *plus* the Clampmatic feature which assures contacts tight as a bolted connection . . . *plus* stylined cabinets of modern design . . . all at no price penalty! They pay no more but get a lot more!

Capacities from 30 Amp. to 1200 Amp.

BULLDOG

ELECTRIC PRODUCTS COMPANY

BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN
In Canada: BullDog Electric Products, Ltd., Toronto
Field Engineering Offices in All Principal Cities

Buy More War Bonds

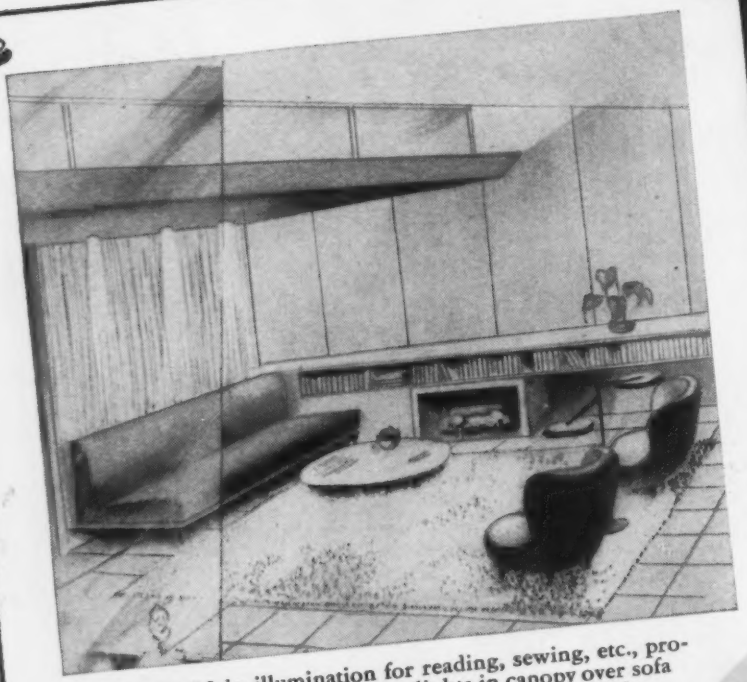
Also Manufacturers of
SaftoFuse Panelboards—Switchboards—Circuit Master Breakers—BUStribution Duct, for "plug-in" power—Universal Trol-E-Duct, for flexible lighting—Industrial Trol-E-Duct, for movable "loads."

BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

Coast Electric & Manufacturing Co.
1720 N.E. Sixth Avenue
Portland, Oregon, Tel. Garfield 2844

Safety Switchboard & Manufacturing Co.
1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224



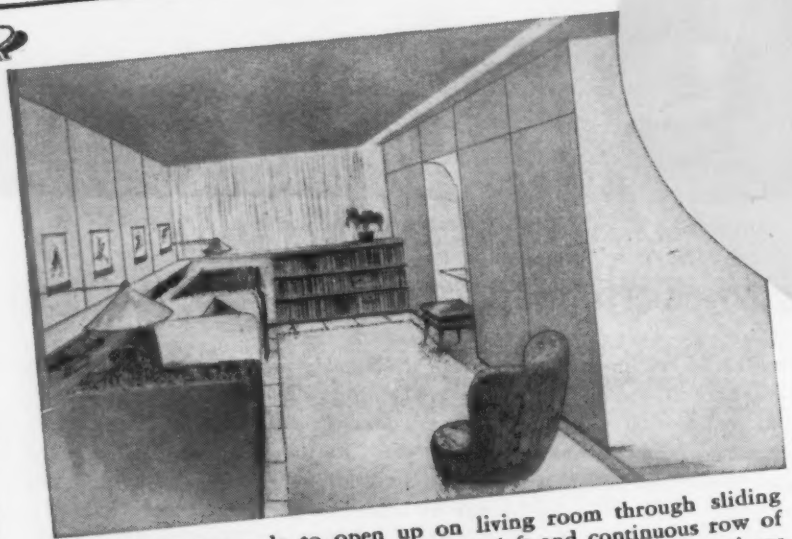
Living Room Main illumination for reading, sewing, etc., provided by R-40 reflector lamp downlights in canopy over sofa and by circular fluorescent portable lamp between chairs. Continuous—row fluorescent in front edge of canopy and behind sofa for added light and decorative effect.

To help you build your postwar lighting markets, General Electric has commissioned 17 leading architects and designers to create new lighting ideas and fixture suggestions for postwar stores, offices and homes. Cooperating fixture manufacturers are planning fixtures around many of the new lighting ideas developed through this G-E program.

On these pages General Electric illustrates some of the modern lighting effects that Designer G. McStay Jackson of Chicago believes are appropriate for postwar homes of modest size and price. Mr. Jackson's concepts

THERE'S NO *this*

.. But G-E's Dramatic New



Bedroom can be made to open up on living room through sliding wall arrangement. Note reading lamps at left and continuous row of fluorescent in ceiling at right. Dressing-table alcove and mirror (right center) lighted by F lamps behind crystal diffusing glass.

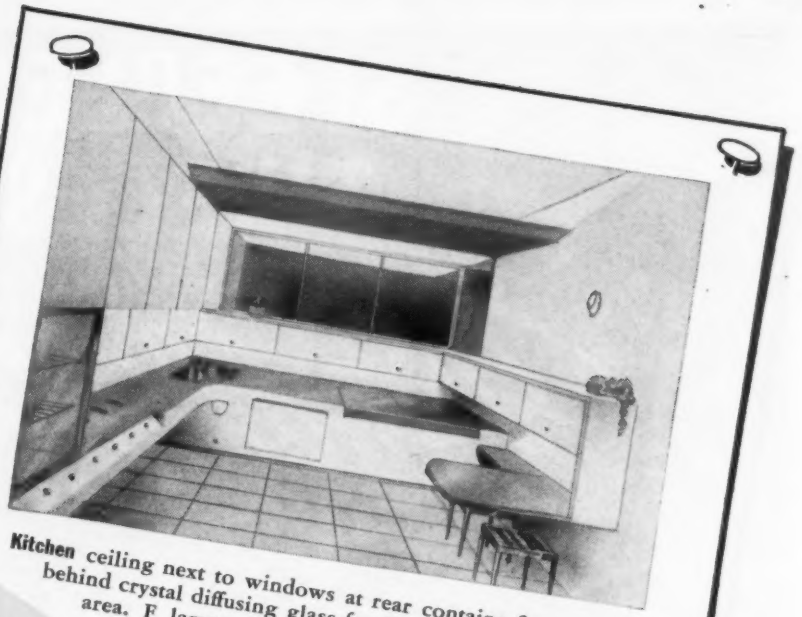
Keep Buying War Bonds— Keep the War Bonds You Buy

GENERAL ELECTRIC

represent lighting that is modern not only in form and imagination but also in levels of illumination.

Ideas like these will help you give the owners of new postwar homes the highest standards of lighting they ever have known . . . and will influence the relighting of existing homes as well.

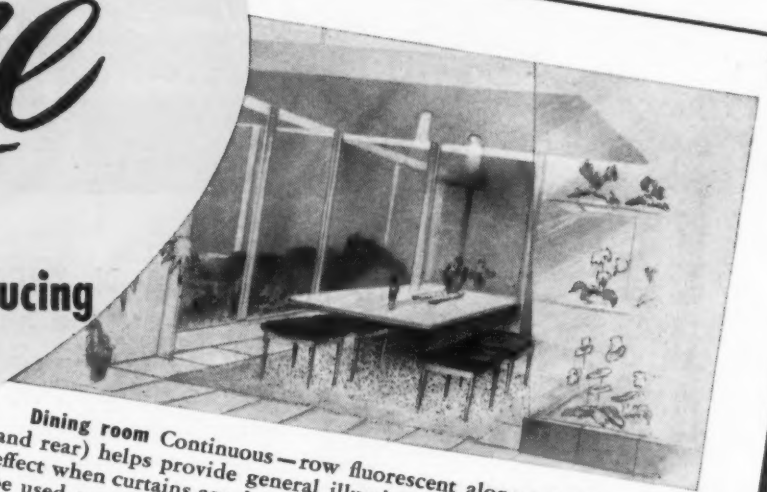
A complete brochure describing Mr. Jackson's suggestions now is being written. If you would like to receive a copy, write Div. 166-ET-J- General Electric Lamp Department, Nela Park, Cleveland, Ohio.



Kitchen ceiling next to windows at rear contains fluorescent behind crystal diffusing glass for illumination over work area. F lamps recessed in panel across center of kitchen provide indirect general lighting. Fluorescent lamps under cabinets at left and right.

PLACE LIKE *home*

Design Program is Producing Home Lighting Ideas!



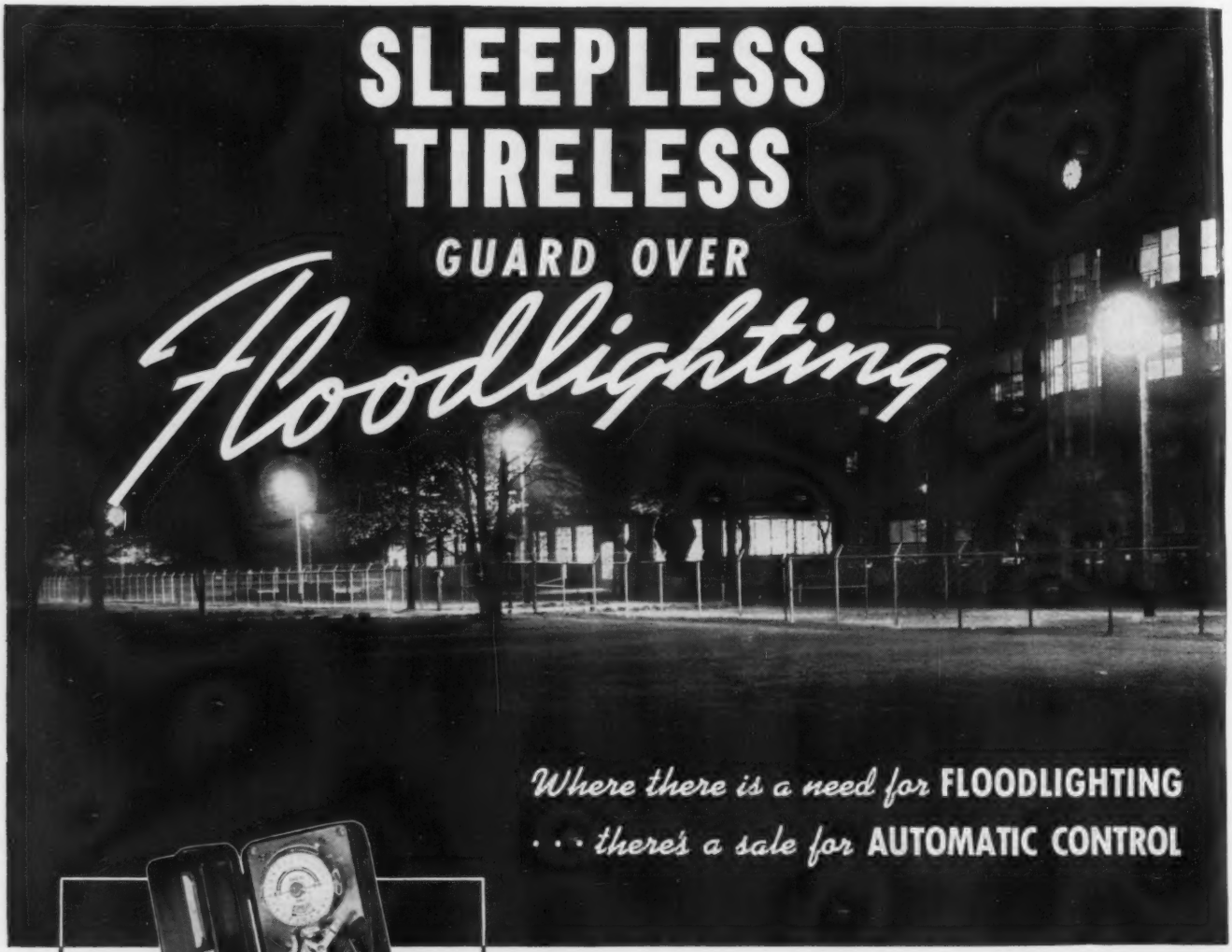
Dining room Continuous—row fluorescent along windows (left and rear) helps provide general illumination and creates luminous effect when curtains are drawn. Filament downlights over table can be used separately or in combination with the fluorescent.

Hear the General Electric radio programs: "The G-E All-Girl Orchestra", Sunday 10 p.m. EWT, NBC; "The World Today" news, every weekday 6:45 p.m. EWT, CBS.

"TO MAKE G-E LAMPS STAY BRIGHTER LONGER"
The Constant Aim of G-E LAMP RESEARCH

G-E MAZDA LAMPS

SLEEPLESS TIRELESS GUARD OVER *Floodlighting*



Where there is a need for **FLOODLIGHTING**
. . . there's a sale for **AUTOMATIC CONTROL**

SANGAMO TIME SWITCHES

• There are types to meet every protective lighting control need. The complete line includes Astronomic Dial, Synchronous Carry-Over, and Outdoor Time Switches. Form VSW2 Astronomic Dial Time Switch is shown above. Current interruptions up to 10 hours will not stop it nor affect its "on" and "off" settings.

ARMY (E) NAVY

★

"A SLEEP ON THE JOB" and overtiredness happen where the human element is concerned. But not so with SANGAMO TIME SWITCHES. Never sleepy . . . never tired . . . always on guard, giving users full protection, so that the "on" and "off" times of floodlighting are exactly as scheduled.

It all means that there is an added sale for you whenever you sell floodlighting. You'll find that the idea of safeguarding with SANGAMO TIME SWITCHES is well received by those who order floodlighting installations.

Add to your new SANGAMO TIME SWITCH prospects the sales that can be made to present users of floodlighting who do not have automatic control and are subject to the serious consequences of forgetfulness, error, and neglect.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

These Ducts
HAVE WHAT IT TAKES
—for reliable cableway service

Here are some outstanding reasons why J-M Transite Conduit and Korduct serve so well under the most severe conditions—

Inorganic . . . made of an asbestos and cement composition which provides permanence and strength, makes the ducts immune to rust or rot.

Permanently smooth bore . . . long cable pulls and replacements are made easier. Danger of damage to cables is minimized.

Easily and quickly installed . . . long, light-weight lengths and simple assembly method assure rapid, economical installation.

Immune to electrolysis . . . being entirely inorganic and non-metallic, these ducts are not affected by electrolytic or galvanic action.

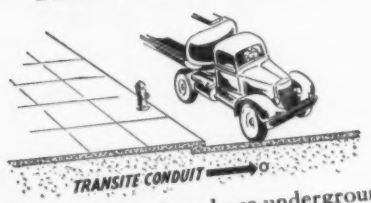
Lower cable temperatures . . . an advantage resulting from a relatively high rate of heat dissipation.

Incombustible . . . won't contribute to the formation of dangerous smoke, gases, or fumes. If burnouts do occur these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

* * *

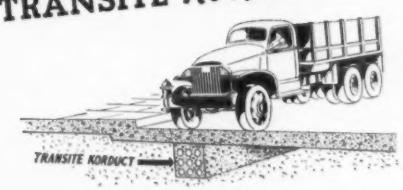
For complete details on Transite Ducts, write for Data Book, DS-410, Johns-Manville, 22 E. 40th St., New York 16, N. Y.

TRANSITE *CONDUIT*



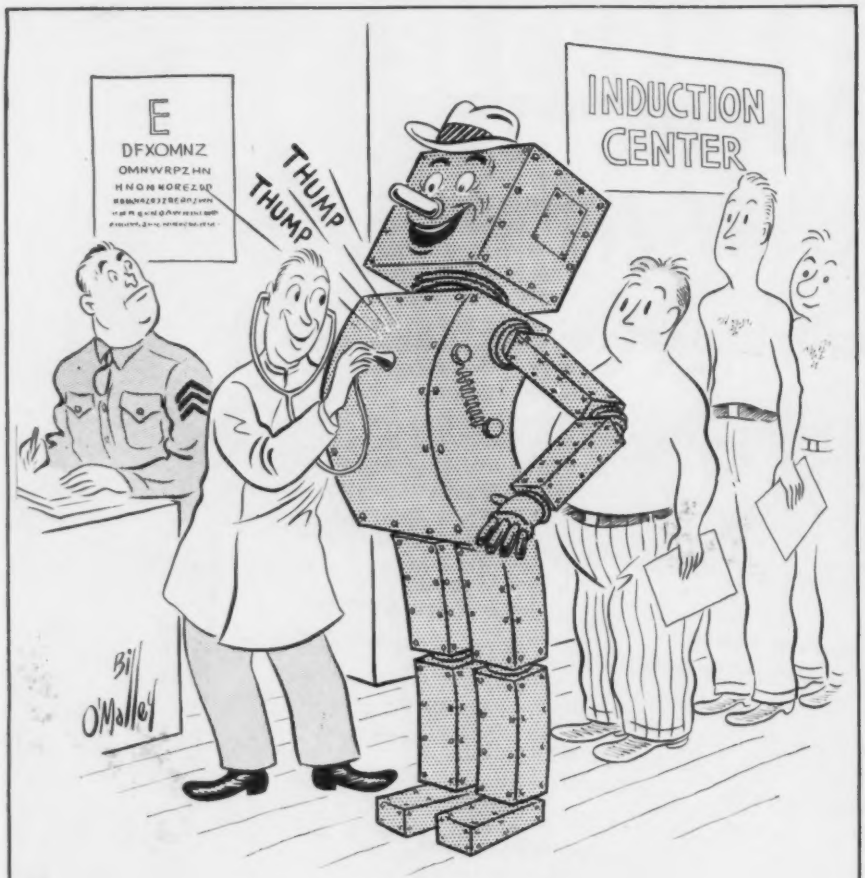
For exposed work and use underground without a concrete encasement.

TRANSITE *KORDUCT*



For installation in concrete. Thinner walled but otherwise identical with Transite Conduit.

JOHNS-MANVILLE *TRANSITE DUCTS*



"SURE I'M I-A DOC, THE LEO J. MEYBERG COMPANY SUPPLIES ALL MY PARTS"

Speaking of drafts, hundreds of California industries consider us "1-A."

They draft us to help furnish them with all kinds of electric and electronic supplies—and in a hurry. We have the broadest selection of electric and electronic stocks on the sunset side of the Rockies—a list of items that covers the entire frequency range of the electromagnetic spectrum. If we haven't got what you want in stock, we know where to go to get it for you—as fast as the W.P.B. allows.

Too, we're ready and able to help you engineer a complete industrial public address system—or solve a tough heating or drying problem using Near Infra-Red application, or throw some light on the job of illuminating plants or offices with incandescent or fluorescent lighting.

Send us a "draft notice" today—we'll appear, ready to deliver.

ST—CMF: Save Time, Call Meyberg First!

LEO J. MEYBERG CO.

Incorporated

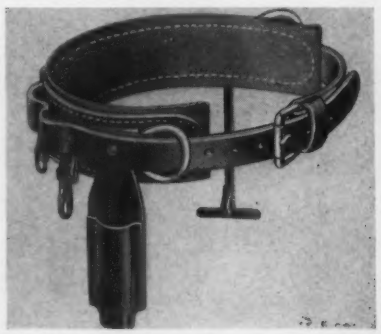
70 Tenth St., SAN FRANCISCO, 1 TELEPHONE UN 1212

2027 S. Figueroa St., LOS ANGELES, 7 TELEPHONE PR 6011

MOST COMPREHENSIVE INDUSTRIAL ELECTRIC AND ELECTRONIC STOCKS IN THE WEST

Lineman's Belt (1008)

A lineman's tool belt made of a specially developed material called Klein-Kord, has been introduced by Mathias Klein & Sons. This newly developed material consists of multi-ply, specially woven long-staple cotton laid in rubber and vulcanized, and is claimed by the manufacturer to be waterproof and to have a tensile strength many times that demanded in actual service and to possess uniform quality, great strength and flexibility. Another feature claimed by the manufacturer is the fact that the strength of the material permits the use of a positive action, tongue type buckle.



Voltage Regulator (1009)

Electric Machinery Mfg. Co. is making a new voltage regulator, the Synchrostat, designed for use with a-c electric generators using direct-connected, belted or motor-driven exciters, 50-60 cycles standard. It consists of a basic metal-enclosed unit adaptable for regular generator switchboard mounting and for mounting on top of the generator in packaged power units. Voltage regulation is plus or minus 2%. The regulator is of the synchronous-contact type; employs a "swing-door" construction, with all operating parts mounted on the back of a hinged door.

Autotransformers (1010)

General Electric has a new line of single-phase autotransformers for aircraft. They are claimed to be particularly adaptable for operation of 28-volt lamps, electrically heated flying suits and other low-voltage aircraft accessories. They can be operated at any altitude from sea level to 60,000 ft. and will function properly in temperatures from minus 40° F to 140° F, according to the announcement. They are said to be satisfactory for operation over a frequency range from 380 to 420 cycles and for continuous use at an overvoltage of 5%.

Air Coolers (1011)

Drayer-Hanson, Inc., has a new series of Spasaver ceiling type air coolers for cold rooms and large refrigerators. These units are equipped with new type propeller fans, according to the announcement, and are said to operate with little noise. Coils are of the fin and tube type, equipped with D & H kinetic type refrigerant distributor. Motors are slow-speed totally enclosed ball bearing, 115 volt, single phase, 60 cycle.

Collector Devices (1012)

Gibson Electric Co. has announced current collector devices made of silver and silver alloys. These devices include commutator bars, collector rings, motor brushes and sliding contacts.

(1008)

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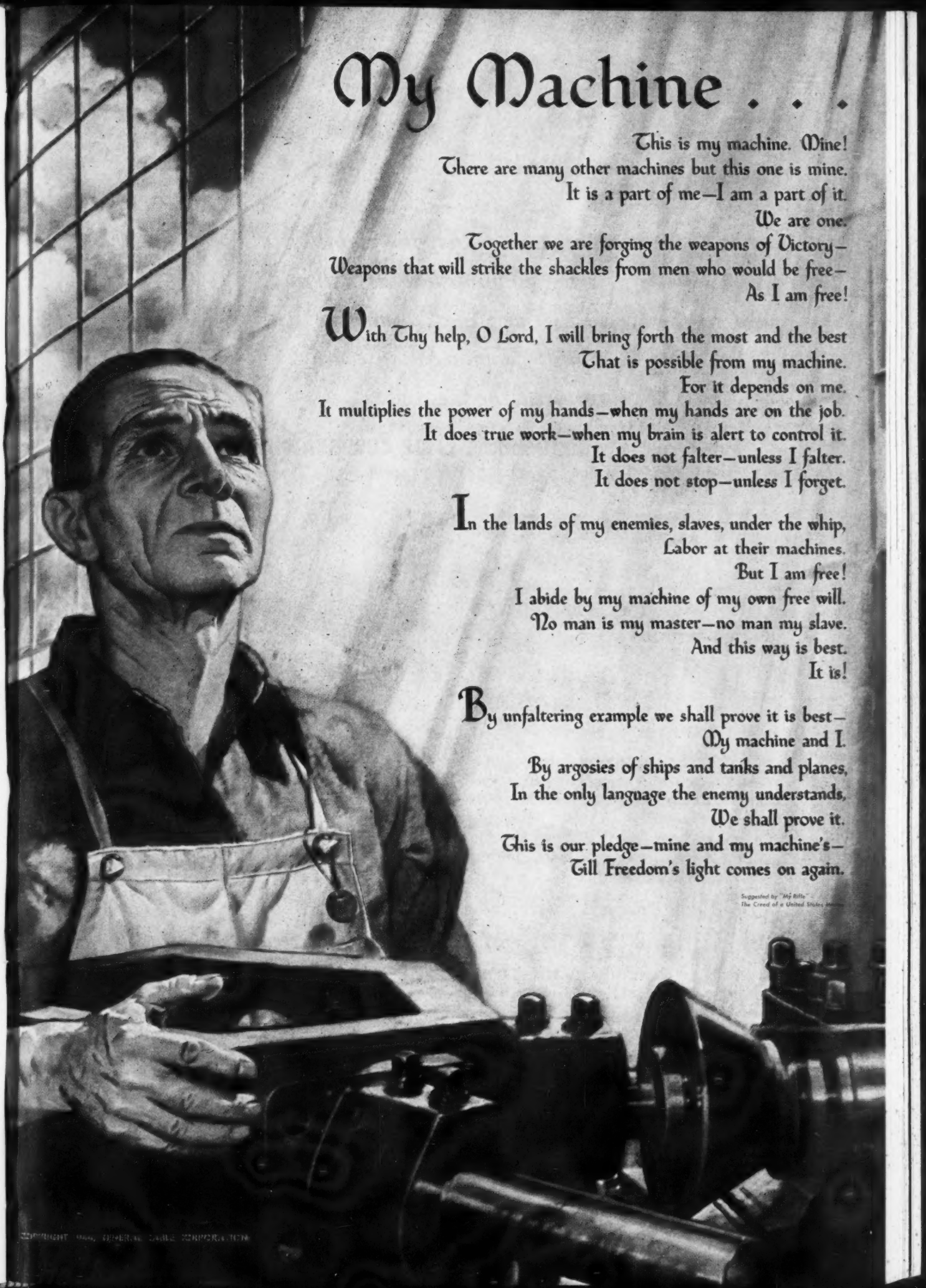


My Machine . . .

This is my machine. Mine!
There are many other machines but this one is mine.
It is a part of me—I am a part of it.
We are one.
Together we are forging the weapons of Victory—
Weapons that will strike the shackles from men who would be free—
As I am free!

With Thy help, O Lord, I will bring forth the most and the best
That is possible from my machine.
For it depends on me.
It multiplies the power of my hands—when my hands are on the job.
It does true work—when my brain is alert to control it.
It does not falter—unless I falter.
It does not stop—unless I forget.

In the lands of my enemies, slaves, under the whip,
Labor at their machines.
But I am free!
I abide by my machine of my own free will.
No man is my master—no man my slave.
And this way is best.
It is!

By unfaltering example we shall prove it is best—
My machine and I.
By argosies of ships and tanks and planes,
In the only language the enemy understands,
We shall prove it.
This is our pledge—mine and my machine's—
Till Freedom's light comes on again.

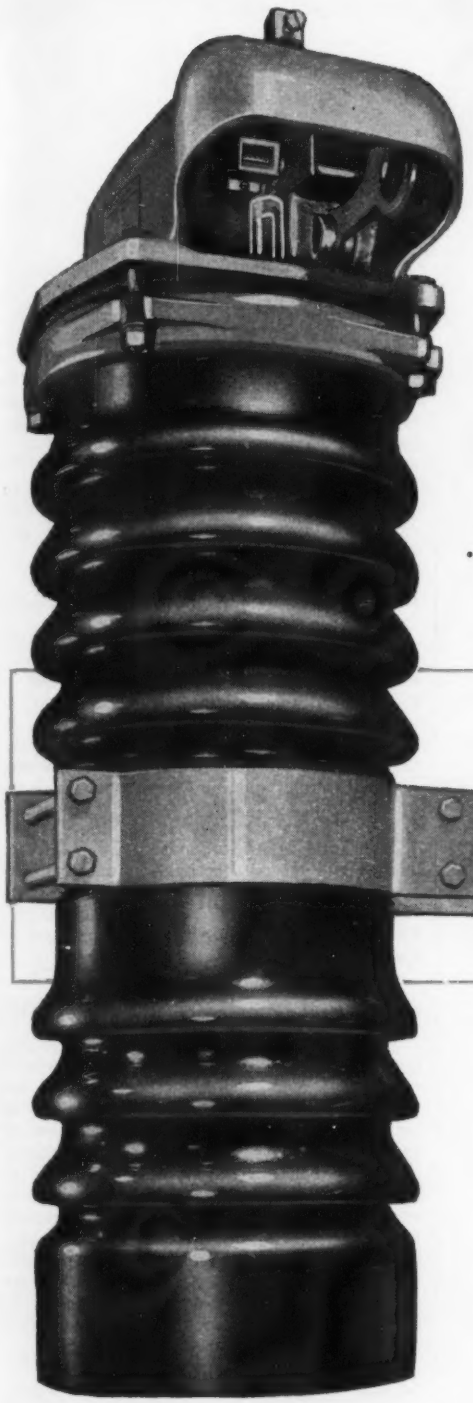
Suggested by "My Rifle"—
The Creed of a United States Marine

COPYRIGHT 1942, GENERAL CABLE CORPORATION

This war poster, the eighth of a series, is published as a tribute to the men and women in war plants from coast to coast who inspired the message.

GENERAL CABLE CORPORATION

If engaged in war work: larger bulletin board copies (25 x 35 inches) are available with our compliments. Write GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.

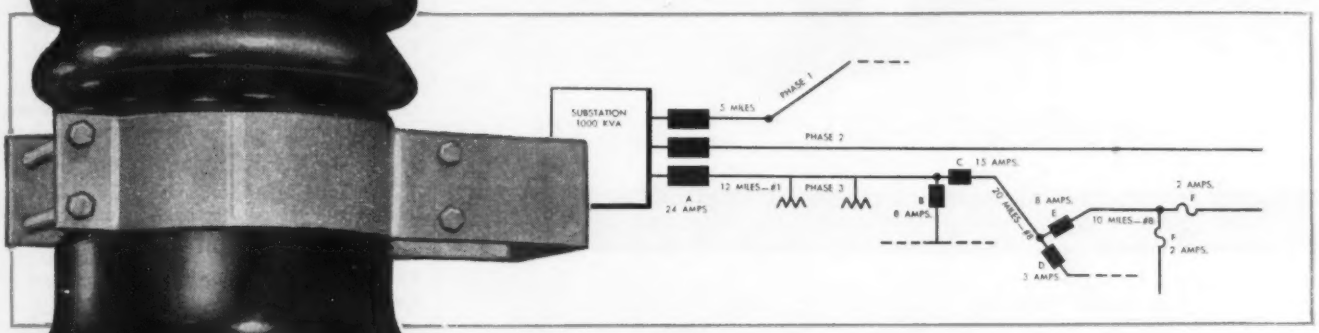


ISOLATE FAULTS

ON RURAL LINES

. . . by accurately co-ordinated circuit protection with the new

Westinghouse AR-I Automatic Recloser



Over 80% of all faults are of a *temporary* nature.

Westinghouse engineers have utilized this fact—with the result that the great majority of rural line outages and service trips are now unnecessary! They have developed the Westinghouse AR-1 Automatic Recloser which discriminates between permanent and temporary faults!

The recloser interrupts *all* faults—but recloses and restores service on temporary faults. On permanent faults, it locks out and must be reset by hookstick.

Time-lag tripping permits accurate co-ordination with other reclosers and with standard fuses. Length of line out of service is reduced to an absolute minimum.

Data telling you how to select and co-ordinate the recloser with other circuit protection are now available in book form. Write for your copy of B-3329. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania, Dept. 7-N. J-60545

TIME-LAG TRIPPING

PERMITS

- Co-ordinating reclosers with each other and with fuses
- Burning faults clear and restoring service
- Energizing line after lock-out without by-pass switch

PREVENTS

- Simultaneous tripping of reclosers
- Unnecessary tripping on momentary overloads
- Chattering
- Tripping of immediate and preceding reclosers when re-energizing line

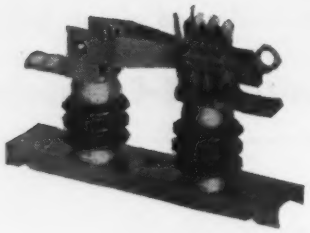
Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

AR-I RECLOSERS

EARL S. CONDON COMPANY
357 S. Hill Street Los Angeles 13, California

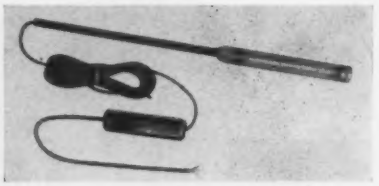
COLE ELECTRIC CO.
Disconnecting Switches



Earl S. Condon Co., represents: UNITED STATES RUBBER CO. Wire and Cable Div. LAPP INSULATOR CO., INC. • BURNDY ENGINEERING CO., INC. • COLE ELECTRIC CO.

ONLY Vaculator
At your Jobber's NOW!
offers an "INSURANCE POLICY" guaranteeing THE WORLD'S FINEST CUP OF COFFEE!
Backed by the GREATEST AD CAMPAIGN ever put behind any coffee maker!
8 CUP . . . $2.95
4 cup (with cover) $2.95
★
Made with PYREX Brand Glass
25 MAGAZINES! OVER 46,000,000 MONTHLY CIRCULATION! INCLUDING: Liberty • Life • Cosmopolitan • Saturday Evening Post • Ladies' Home Journal • Women's Home Companion • American • Good Housekeeping • American Home • Country Gentleman
HILL-SHAW CO., 311 N. Desplaines St., Chicago 6, Ill.

Inspection Light (1013)



Day-Ray Products, Inc., is marketing a fluorescent light designed for inspection of drums and barrels through bungholes. This light is 1½ in. in diameter and is available in 6- and 8-watt sizes for operation on 60-cycle, 120-volt circuits. Lighting element is a Mazda fluorescent bulb, enclosed in plastic; the cord is sealed by brass bushing and gasket to make the unit moistureproof and capable of burning under water. Over-all length is from 29 to 32 in., including an 18-in. removable handle. The light is furnished with 25 ft. of 18-2 RC cord and adjustable hook for convenient hanging.

Noise Suppression Device (1014)

To reduce radio-noise voltage from generators, inverters, motors and other equipment, General Electric has designed a Pyranol radio-noise suppression capacitor. It is of the thru-stud type with a terminal at each end. One line of a d-c or a-c power circuit can be fed through the unit, reducing internal inductance and resistance and increasing filter efficiency for a given capacitance.

This unit is approximately 1¾ x 3⅝ in. and weighs 4½ oz. It can be mounted in any position and will operate over a temperature range of plus 50° C to minus 50° C. Rated 0-100 amp, 250-volts maximum a-c or d-c, 0.55 microfarad.

Fuse Panel (1015)

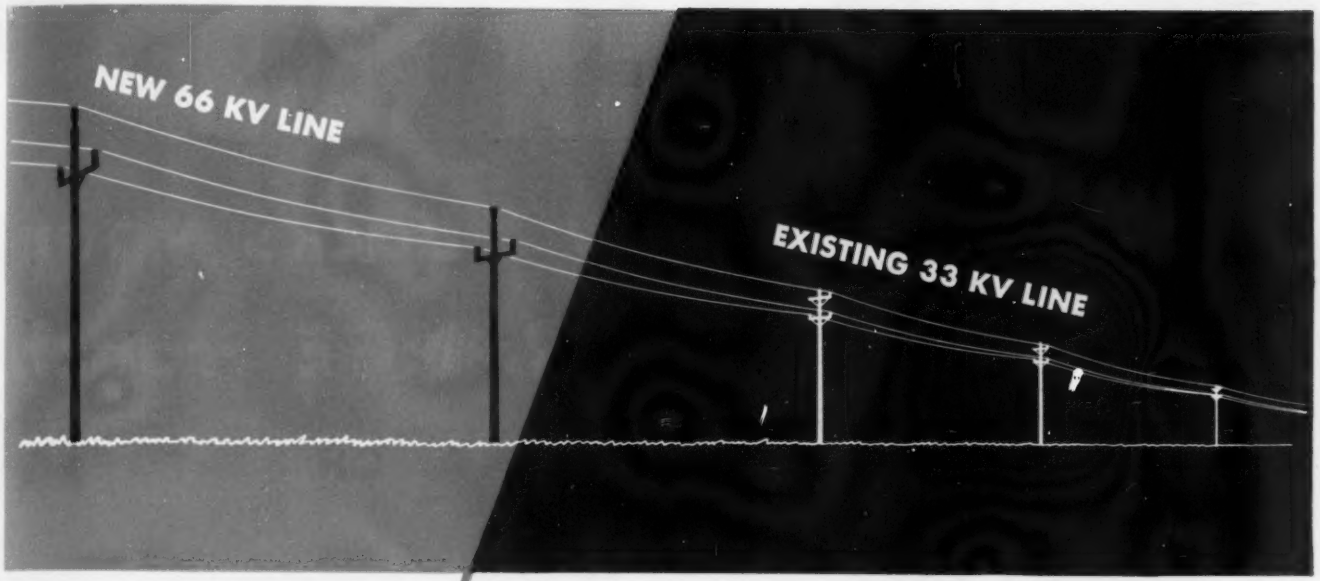
Littelfuse Inc. has announced an improved fuse panel, No. 1505, said to be particularly suited to use in airplanes. According to the manufacturer, this panel can be placed at an accessible point other than in a central junction box and this dispersal throughout the plane renders the panels less liable to damage. They are designed also for use on shipboard in various signal control points, for industrial laboratories or shop benches for holding bars of various diameters, and as temporary switches. The panel is for Littelfuse 3 AG and 3 AB; 4 AG and 4 AB; 5 AG and 5 AB; Aircorps type fuses and clips.

Heat Circulator Fan (1016)

Reynolds Electric Co. has a new model heat circulator fan, designed to blow air upwards, along the ceiling, down the walls and up the center again. This fan is supplied with 24-in. diameter propellers. The regular ceiling model normally blows up but can be adjusted to blow in other directions, it is stated. Can be supplied in 115 volts, 60 cycle a-c, 300 watts per hour. Supplied for industrial uses without priority by securing approval on form WPB-541.

Ballasts (1017)

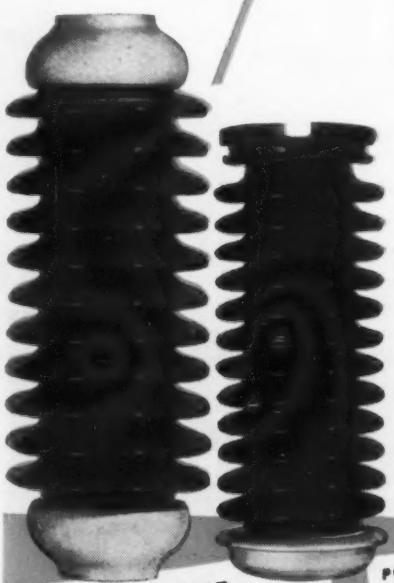
General Electric has designed a new line of Tulamp 40-watt ballasts in streamlined drawn steel cases, which it claims better fi the contours of today's lightweight fluorescent fixtures. The new ballast is for externa mounting on top the fixture and has botton leads. The case is finished in dark grey.



LINE CONVERSION WITH LAPP LINE POSTS

is the fastest way to fortify your system.... and uses least materials

New or increased load demands frequently can most efficiently be handled by conversion of existing lines to higher voltage. For this job, Lapp Line Posts are particularly suited. Using present sound poles and conductors, conversion to higher voltages can be accomplished with no more than new cross-arms and Lapp Line Posts. Nor need such construction be considered as an emergency temporary expedient. Such a line approaches the current ideal for a new line; and your Lapp Posts can be expected to give trouble-free service for a longer period of years than you ever got from conventional insulators.



Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, N. Y.

LAPP LINE POST and STATION POSTS on your system offer . .

POWER ARCOVER. *Flashover and leakage distances are not appreciably lowered by damage —even loss of several petticoats.*

NO PUNCTURE. *Puncture path in Lapp Post design is as great as flashover path. Insulator will flash over rather than puncture.*

NO CRACKING. *One piece post body, not subject to bursting from tension strains created by thermal changes in nested parts.*

RADIO INTERFERENCE. *By virtue of design factors alone, radio interference is permanently prevented at rated neutral voltage.*

NO CLEANING. *Fog-type design preserves uniform leakage path, prevents leakage flashover, makes the unit "self-cleaning."*

MECHANICAL RUGGEDNESS. *Stones or bullets deflect off, or rupture petticoats, leaving post body intact and insulator secure.*

21 YEARS

OF "KNOW-HOW" backs your Monarch ELECTRIC RANGE Franchis

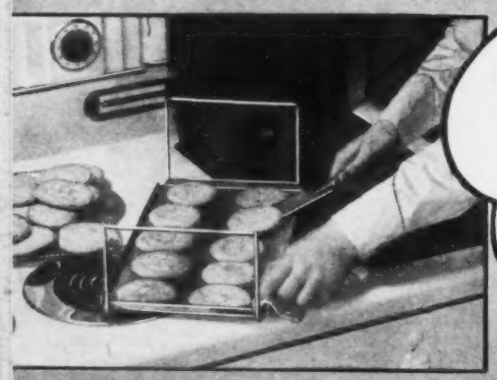
HERE ARE ADDITIONAL* MONARCH FEATURES

SURFACE BAKING

The Monarch deep-well cooker with "side heet" makes an ideal surface oven for baking, roasting, steaming. Saves current.

"DEEP HEET" SAUCE PAN

Monarch "deep heet" sauce pan speeds cooking, protects vitamins, improves flavor, saves current.



AUXILIARY OVEN

An exclusive Monarch operation: baking cookies in the cooking top roaster compartment of the Roaster Range. Plus being a current saver, is handy, convenient.

It's a pleasure to sell an appliance when it gives you sales features competition cannot match. Monarch's post-war Electric Range Line will give you that pleasure! All the "know-how" of 21 years of electric range-building experience — plus the most modern manufacturing facilities — will be embodied in a full, new line that will uphold Monarch's pre-war leadership in quality and user satisfaction.

IF IT'S A ROASTER RANGE IT'S A Monarch ELECTRIC PATENTED

★ See Monarch Electric Ra... advertisem... in last month... issue.

ARMY NAVY E

Write for exclusive franchise

MALLEABLE IRON RANGE CO.

3284 Lake St. Beaver Dam, Wis.

Write to receive the monthly "MONARCH REPORTER" and keep posted on Monarch's post-war program

15 YEARS

OF "KNOW-HOW" backs your

Monarch ELECTRIC WATER HEATER franchis

When you take on that line of Electric Water Heaters — which you will if you've got your post-war ear to the ground — you will want a line that is tried, proven, and identified with a trade mark that enjoys full consumer acceptance. MONARCH is such a proven line. MONARCH will bring to you 15 years of experience in building this type of equipment — assuring you a definitely superior water heater to offer your trade.

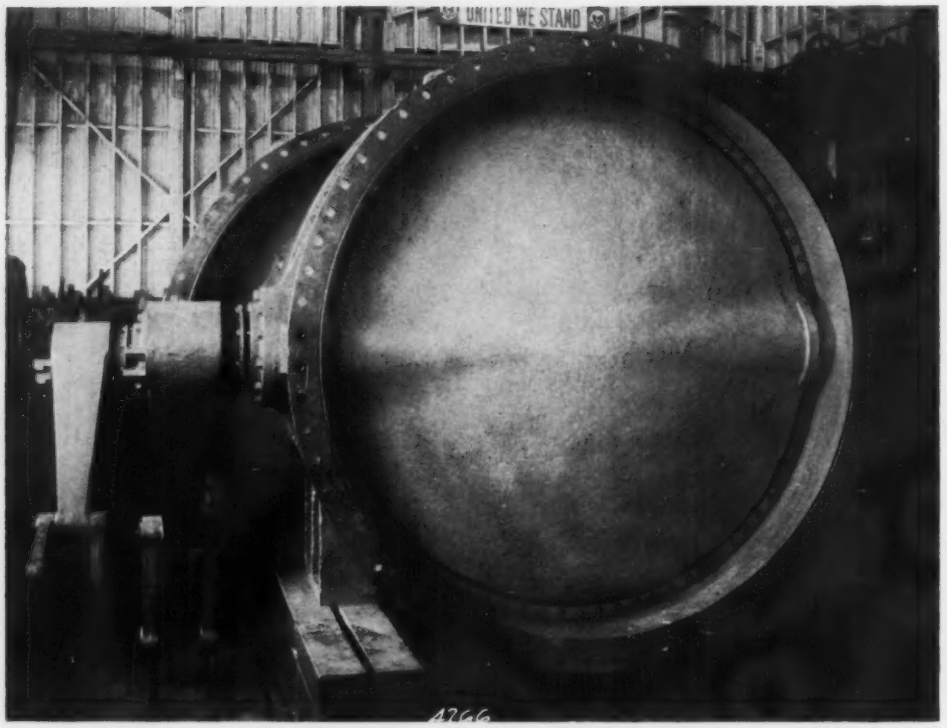
Write for exclusive franchise

MALLEABLE IRON RANGE CO.
3284 Lake St. Beaver Dam, Wis.

SERVICE-FREE

There is no major appliance that requires as little servicing as a Monarch Electric Water Heater. Simple to install, it faithfully supplies hot water year-in and year-out with no attention. Your profit margin is clean-cut, permanent.

KEEP THE
NTIRE FAMILY IN HOT WATER



10-Foot Butterfly Valves built by PELTON for Pit No. 5

A BUTTERFLY VALVE 10 feet in diameter controls the flow of water to each of the four penstocks leading to the turbines at Pit No. 5—the 214,477-horsepower hydroelectric plant recently completed by the Pacific Gas and Electric Company.

Built by Pelton, these valves have improved contour of the discs which permit the water to flow with the least turbulence while improvements in the seal ring and seat construction end leakage.

The hydraulic operating mechanisms, not pictured here, have been developed for maximum safety and reliability under all operating conditions.

Throughout the entire history of hydroelectric development, Pelton has played a leading part in designing better and better butterfly valves, relief valves, pressure regulators, turbines and their control equipment.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

2929 Nineteenth Street San Francisco,10

Other Sales Offices in the United States:

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BLW THE BALDWIN GROUP

PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

Copperweld wire

-29 YEARS

of dependable performance in the Power, Communication and Transportation fields

In 1915 Copperweld was introduced to the Power, Transportation and Communication fields. The natural advantages of copper-covered steel—high strength, high conductivity, corrosion resistance and permanence—quickly earned a place for this material. Today, 29 years later, millions of miles of Copperweld products—made from copper molten welded to a core of high-strength alloy steel—are serving efficiently and economically in the form of power conductors, guy and messenger strand, overhead ground wire, telephone and signal wire, signal bonds and ground rods.

Our long experience, augmented by the intensive developments in research and manufacturing made during these war years, will enable us to serve you better than ever before when Copperweld is again available for peace-time needs.

COPPERWELD STEEL COMPANY

GLASSPORT ARMY E NAVY PENNA.

Pacific Coast Representative: C. E. INGALLS · RIALTO BUILDING · SAN FRANCISCO, CALIFORNIA

• RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES •

CRESFLEX

NON-METALLIC SHEATHED CABLE

FACTORY ASSEMBLED AND TESTED

EASILY INSTALLED AT LOWEST COST

TOUGH PAPER ARMOR

WEATHERPROOF FLAME-RETARDING JACKET

PARTICULARLY SUITED FOR WIRING FARM BUILDINGS, WAR-HOUSING

CRESCENT

WIRE and CABLE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

PACIFIC TERRITORY SALES REPRESENTATIVE
RAY MURPHY, 720 East 2nd Street, Los Angeles, California

• IMPERIAL NEOPRENE JACKETED PORTABLE CABLES •

• ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • BUILDING WIRE •

• PERMACORD • LEAD-ENCASED AND PARKWAY CABLES • SYNTHOL WIRES • WELDING CABLES • SHIPBOARD CABLES •

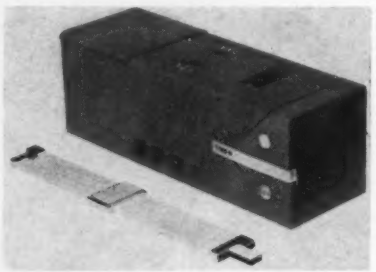
Conduit Gauge (1018)

Three-Point Gage Co. is offering a new model which it states will measure instantly all sizes of pipe from ⅛ to 12 in. and all sizes of electrical conduit and metallic tubing. The gauge is pocket size and consists of two pivoted steel plates with edges curved at three points for contact and scales which automatically register standard sizes of thin-wall tubing and conduit and sizes of pipe in terms of inside measurement. A third scale shows the right drill size for tapping. Inch and metric rules are included.

Coupling (1019)

Lovejoy Flexible Coupling Co. has announced an improved L-R Type C coupling which has an outside steel collar which holds the load cushions in place and protects operators against accident. These couplings are designed for heavy-duty service from 4.60 to 806 hp. at 100 rpm.

Oscillograph (1020)



A miniature, six-element oscillograph has been introduced to the General Electric line. It consists of three principal systems; first the optical system; second, the six parallel galvanometer channels; third, the photosensitive material transporting mechanism with internal motor and removable film holder. The enclosing light-tight metal case is 4½ x 4½ x 14 in. and weighs approximately 10 lb.

Industrial Units (1021)

Curtis Lighting, Inc., has designed a new series of fluorescent units for use in industrial plants, airplane hangars and similar locations. The new series is for two and three 40-watt lamps. Units can be hung individually or in continuous rows.

New F Line (1022)

A. L. Smith Iron Co. is offering a new line of industrial fluorescent fixtures equipped with its V controlled light reflector. The units are all-steel construction, have the captive-turn positive reflector fastener or release.

Available Again (1023)

Edwin L. Guth Co. announces that its Futurliter fluorescent luminaire is again available. This unit is made for two and three rows of 40-watt lamps and can be mounted direct to the ceiling or suspended. It is available with sections for cooling, air disinfecting or color correction.

Paint Stripper (1024)

Turco Products has announced a new paint stripper, which it claims loosens paint for quick removal with water. It is said to be non-corrosive on metals and safe on wood.

Electrical World Survey Shows INDUCTION REGULATORS in 1st PLACE for getting the voltage up and holding it there

A survey of distribution trends recently completed by "Electrical World" was reported in the June 24 issue, with the following comments:

"Delivery of adequate and appropriately sustained voltage is a primary index of the adequacy of distribution and it is significant that the induction regulator held first place before the war and will retain the lead after the war as a means of getting the voltage up and holding it there .... It outstrips all other approaches to sustained voltage adequacy for the postwar period."

HERE are some of the reasons for the continued popularity of induction regulators:

No time delay. Induction regulators act immediately to either raise or lower the voltage as soon as a voltage fluctuation reaches the edge of the band for which the controls are adjusted. Regulators which require a time-delay mechanism cannot act until the *average* voltage has been outside the band-width setting for a time equal to the time delay.

Narrow band width. The narrow band width makes possible a higher average voltage level without exceeding allowable maximum values. This results in (a) savings of revenue otherwise lost due to low voltage at time of peak load, (b) increased load-carrying ability, (c) longer feeders.

Low maintenance cost. The simplicity of the operating mechanism—the direct-gear drive, and the dynamic braking that does away with springs, latches, and snap-action mechanisms—permits a practically unlimited number of operations without increasing the very low maintenance cost.

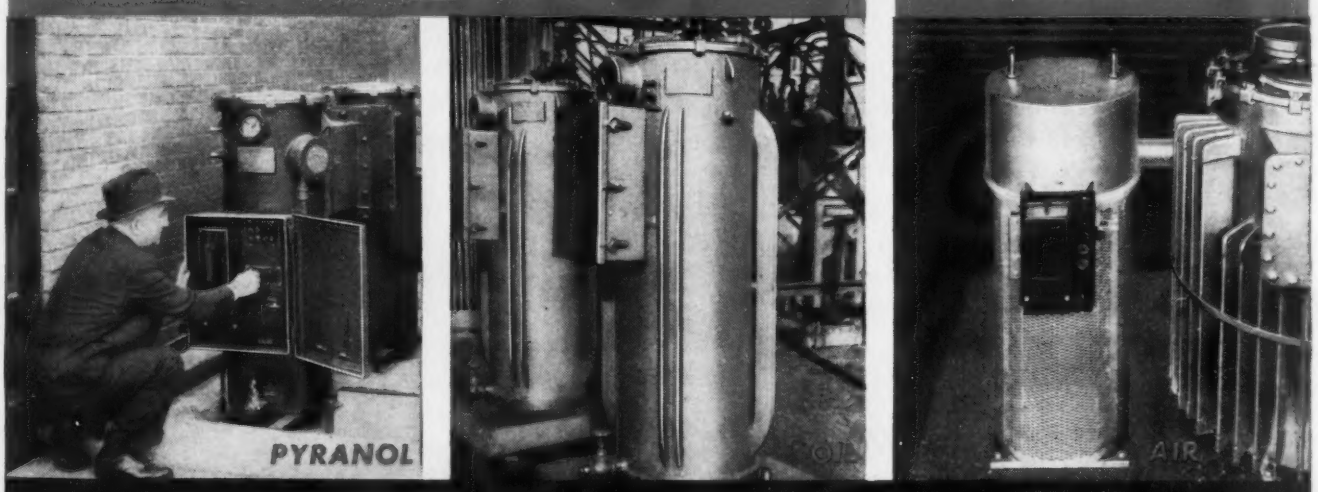
Dependable performance. The induction regulator has established a record of more than 40 years of excellent performance under all conditions of operation.

Ask your G-E representative to estimate the results you can obtain on your feeders. Or write for Catalog GEA-2742C. *General Electric Company, Schenectady 5, N. Y.*

G.E. BUILDS ALL THREE TYPES

LIQUID-FILLED FOR PRIMARY CIRCUITS, 6900 VOLTS AND BELOW

DRY-TYPE FOR SECONDARY CIRCUITS, 600 VOLTS AND BELOW



GENERAL ELECTRIC

BUY WAR BONDS

Continuous Supplies...

CALL FOR MOUNTING DOLLARS

Official U. S. Coast Guard photo

Official U. S. Marine Corps photo

....STEP UP YOUR PAY ROLL PLAN!

War is a continuous job.

Ever-widening, ever-advancing fighting fronts call for a never-ending flow of manpower and materiel—*financed by a continuous flow of money.*

Your responsibility as top management increases with the mounting tide of battle. You've been entrusted with two major responsibilities—steadily maintained production, and steadily maintained War Bond Sales through your Pay Roll Savings Plan.

So keep this one salient fact before you at all times: *The backbone of our vital war financing operation is your Pay Roll Savings Plan.*

Your job is to keep it constantly revitalized. See to it that not a single new or old employee is left unchecked. See to it that your Team Captains solicit everyone for regular week-in and week-out subscriptions. And raise all percentage figures wherever possible.

Don't underestimate the importance of this task. This marginal group represents a potential total sales increase of 25% to 30% on all Pay Roll Plans.

Constant vigilance, in a quiet way, is necessary to keep your Pay Roll Savings at an all-time high. Don't ease up—*until the War is won!*

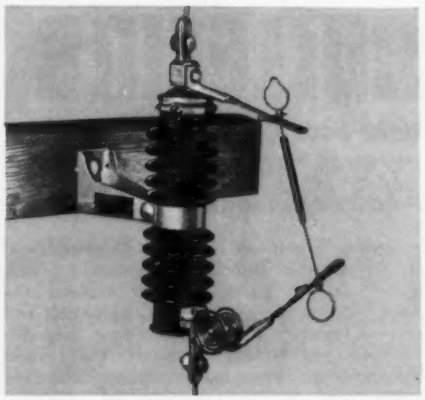
Back the Attack!
SELL MORE THAN BEFORE!

The Treasury Department acknowledges with appreciation the publication of this message by:

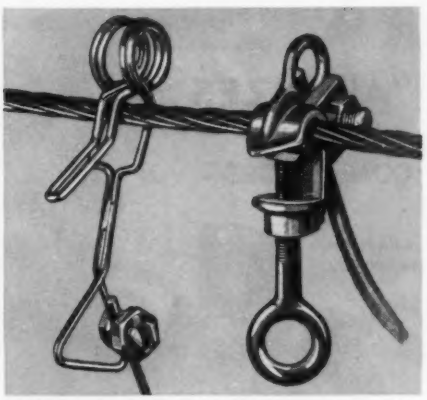
ELECTRICAL WEST

This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council

FUSE LINKS—individually wrapped, then packaged again in packets of five, arrive at the pole just the way they leave the Kearney factory.



LOW MASS, extra-flexible switch parts mean high resistance to mechanical shock and heavy short-circuit rupturing capacity.



CLAMPS. There is a Kearney Con-nec-tap clamp for the most unusual load or construction problem. Made in many types for all wire sizes.

COMBAT LIGHTNING THE EASY WAY

Are you trying to combat lightning discharges the hard way? You are if you're using devices that attempt to choke surges by interposing a high resistance in the path to ground. This method has the effect of keeping a high percentage of the surge on your lines where it may spill over bushings, line insulators or break through transformer windings. In consequence these choked and reflected surges are the direct cause of the many outages from fuse link blowings if not more serious damage, after lightning storms.

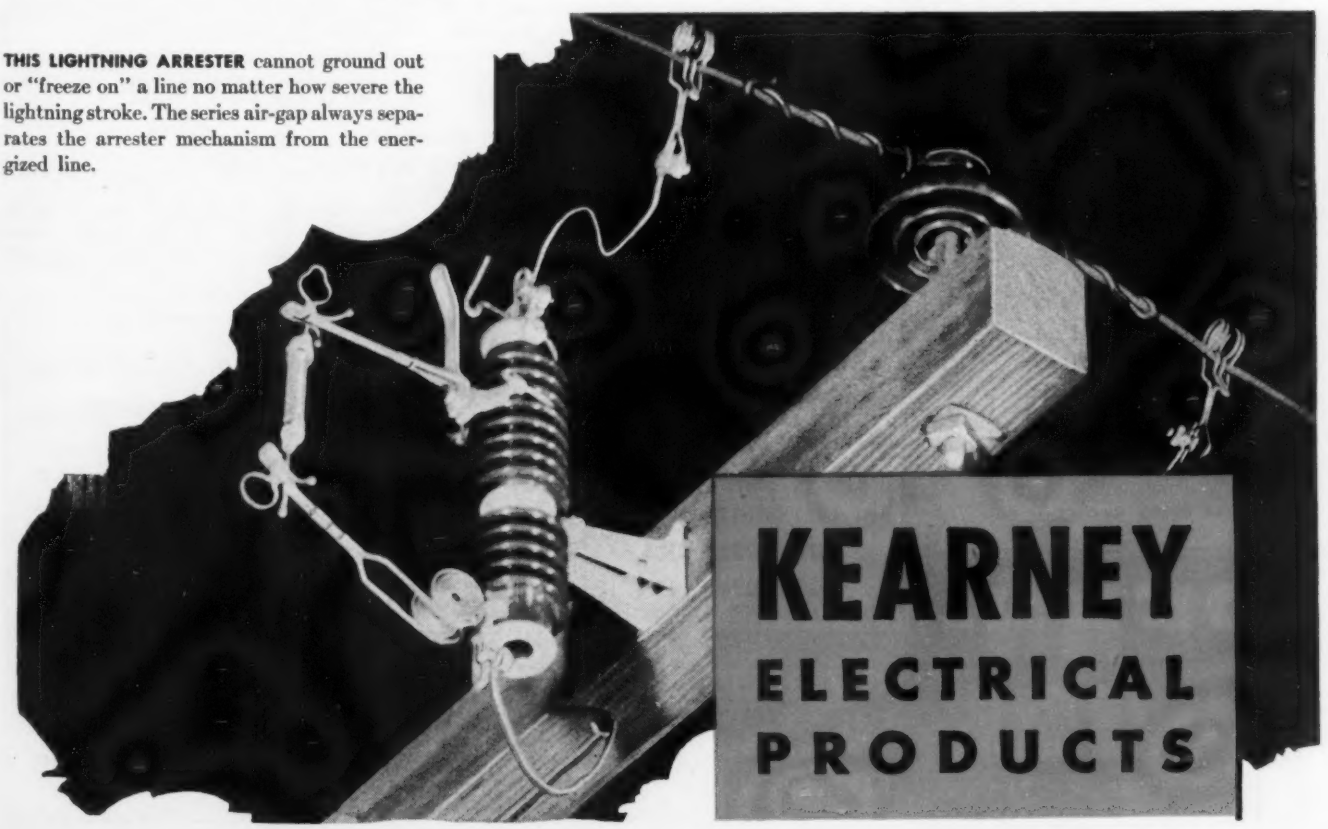
The easy way is to direct lightning surges to ground through a low resistance path so that all of the surge, electrical stress and reflected voltage is drained to ground within a fraction of a microsecond. Power follow-ups are snuffed out usually within the first current zero and your lines will operate through many lightning storms without even blowing a fuse link. This is what you may confidently expect when you change to Kearney Lightning Arresters. What's more you start off with the initial advantage of paying much less for the Kearney Arresters—and they will continue to pay dividends by reducing fuse-blowings, trouble-trips and lightning outages to a new low.

Please address your letter to Department "H",

JAMES R. KEARNEY CORPORATION
4236 Clayton Avenue, St. Louis 10, Missouri

PRACTICAL—SERVICEABLE—DEPENDABLE

THIS LIGHTNING ARRESTER cannot ground out or "freeze on" a line no matter how severe the lightning stroke. The series air-gap always separates the arrester mechanism from the energized line.



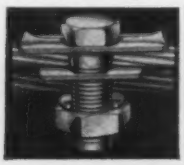
KEARNEY
ELECTRICAL
PRODUCTS

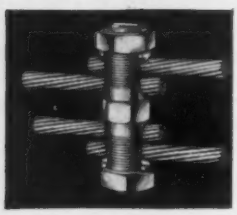
"All **SIZES** of SERVICE CONNECTORS—

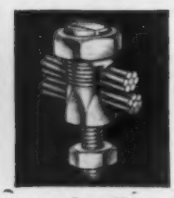
from No. 10 to 1,000,000

and All **TYPES**"

You can find exactly the service connector you need, in the Penn-Union Catalog: Yoke-and-Nut type, in a complete range of sizes . . . Service Entrance connectors . . . Service Post and Special connectors in wide variety.







Also . . . the most complete line of Tee Connectors, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs . . . practically every good type.

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Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

BULLETINS

data books, etc.

Accuracy Standards (1025)

General Electric is offering a 56-page booklet, "Instrument Transformer Accuracy Standards." In two parts, the first explains the ASA accuracy standards for potential and current transformers and shows how they differ from the NEMA standards; the second includes a guide for the selection of standard indoor and outdoor current and potential transformers, with illustrations, prices, ratings, and ASA and NEMA accuracy classifications for each type.

Switchgear (1026)

A catalogue of metal-enclosed switchgear has been released by the I-T-E Circuit Breaker Co. The 32-page publication describes construction features; gives dimensions, conduit locations and approximate weights of both drawout and stationary elements. A diagram of standard symbols commonly used in switchgear drawings is included.

Rural Line Materials (1027)

An 88-page catalogue of rural electrification materials and equipment is available from Graybar Electric Co. Included are drawings of typical rural line structures, materials schedule charts and list of materials. Seven pages are devoted to inside wiring.

Controls (1028)

Wheelco Instruments Co. has prepared data sheets on its automatic and manual type Inputrols and its Rheotrol, devices to maintain desired electric power or heat input, or flow of liquids or gases to any process or equipment.

Unit Heaters (1029)

Electric Air Heater Co. is offering a new bulletin describing its line of unit heaters. The line includes standard sizes ranging from 1.5 to 60 kw. for ceiling, wall or post suspension. Tables give dimensions, B.T.U.s and weights.

Capacitors (1030)

A 20-page booklet giving application data for G-E pyranol capacitors has been prepared by the manufacturer. Contents include power factor and its improvement; low-voltage type pyranol capacitors; high-voltage type.

Infrared Lamps (1031)

Wabash Appliance Corp. has published a brochure on infrared radiant heat lamps.

Insulating Varnish (1032)

Sterling Varnish Co. has prepared a booklet on the Zanderoll process for the application and treatment of insulating varnish to armatures and stators. Cost saving and product improvement are claimed for the new process.

Rectifiers (1033)

Ignitron mercury-arc rectifiers are the subject of a 30-page booklet released by General Electric Co. Data on design, construction and operation are given. Illustrated by photographs and diagrams.

Transformers (1034)

Standard transformers are described in a bulletin recently released by the company. Power, distribution, rural, street lighting, instrument and air-cooled transformers are described.

Turbine Cleaner (1035)

Shell Oil Co. has published a manual on the use of its Turbo Cleaner, for solvent cleaning of turbines. Illustrated.

Welder Control (1036)

Weltronic Co. has issued a bulletin on its seam welder control. The publication covers application, operation, specifications and other data.

ELECTRICAL WEST, 68 Post St., San Francisco, 4, California

Please send me information about following CIRCLED items:

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Name..... Company*..... Title*.....

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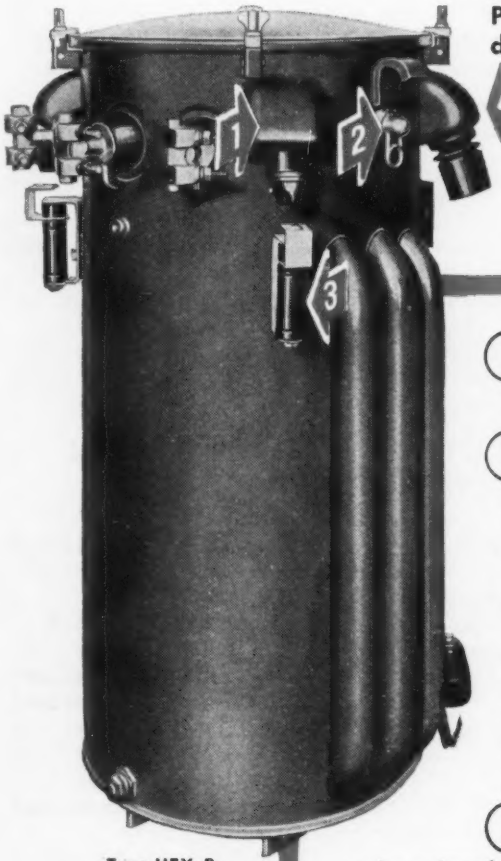
* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

Wagner

SELF-PROTECTED DISTRIBUTION TRANSFORMERS

Maximum savings are realized through the use of Wagner Self-Protected Distribution Transformers because of their improved design, high-quality construction, ease of installation, and high efficiency – a combination of superior characteristics which assures users of low operating and maintenance costs.

Two of the outstanding Wagner Distribution Transformers are the types HEX-P and HEBF-P illustrated. These transformers embody the following features to meet the requirements for surge and overload protection.



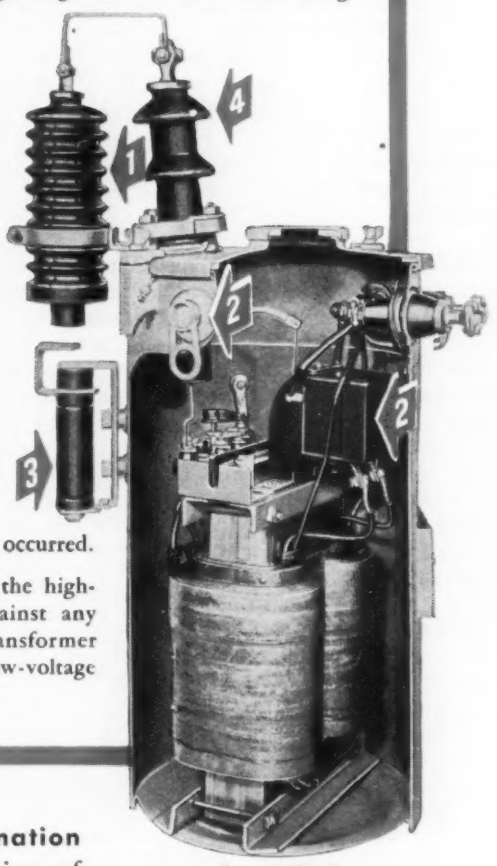
Type HEX-P, 50-kva Distribution Transformer

(1) De-Ion Gap protects transformer against surges. The ability to discharge extremely high surge currents is its outstanding characteristic.

(2) Secondary circuit-breaker protects transformer from secondary short-circuits and overloads. Circuit breakers with overload warning signal-light are furnished on 5-kva sizes and above. 1½ to 3-kva sizes are equipped with breaker only. Breaker reset handle is easily accessible. When furnished, warning signal-light is built into the reset handle.

(3) The De-Ion Gap is isolated from the ground series-resistor by a gap. The external series-resistor is furnished in order to limit the power-current which may flow after a surge has occurred.

(4) Protective links are placed in series on the high-voltage side to protect the feeder against any short circuit that might occur in the transformer windings. The fuse is coordinated with the low-voltage circuit-breaker.



Type HEBF-P, 3-kva Distribution Transformer

WAGNER
Products for Industry include:
MOTORS
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TRANSFORMERS
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INDUSTRIAL BRAKES
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INDUSTRIAL BRAKE LINING

ARMY (E) NAVY — NATIONAL SECURITY AWARD

Write **For Full Information** on the Complete Line of Wagner Transformers.

FOR VICTORY — BUY U. S. WAR BONDS AND STAMPS . . .

Wagner Electric Corporation
ESTABLISHED 1891
6381 Plymouth Avenue, St. Louis 14, Mo., U. S. A.
ELECTRICAL AND AUTOMOTIVE PRODUCTS

T44-12

OKONITE RESEARCH DEVELOPMENT
REPORT NO. 23-Y

August 12, 1944

REPORT AFTER 1 YEAR'S EXPERIENCE ON THE EFFECT OF REPLACING NATURAL RUBBER WITH GR-S(BUNA S) IN OKOLITE INSULATION FOR ELECTRICAL CABLES

We have stated in the past that we are fortunate that the results obtained are so generally satisfactory when Buna S is substituted for natural rubber in Okolite insulation. This is largely because of the fact that natural rubber was a relatively minor ingredient of Okolite and the substitution of Buna S constitutes a smaller change in the compound than in the case of rich rubber compounds. The result is that Okolite S, as we will call Okolite when made with Buna S, is much more like Okolite made with natural rubber and can be expected to be more likely the same in service than in the case of compounds which require greater changes in their composition in order to substitute GR-S or Buna S synthetic rubber for natural rubber. It is obvious that any lack of uniformity in GR-S synthetic rubber will have a greater effect on the properties of an insulation compound in proportion to the amount of GR-S in the compound.

ELECTRICAL STRENGTH: Experience in the manufacture of wires and cables made with Okolite S insulation on a commercial production basis is now approaching one year. The results have been highly satisfactory. The Okolite S insulated conductors are subjected to the same high voltage a.c. and d.c. tests as were used for Okolite made with natural rubber. These high voltage tests are the most severe in use in the wire and cable industry. They help to provide assurance to our customers and to ourselves against weaknesses or defects in the insulation.

INSULATION RESISTANCE: A careful review of our routine test results obtained on all of the Okolite S insulated wires and cables made since January 1, 1944, shows that we can now dependably meet minimum megohm values based on a constant of 10,560 for megohms per 1,000 ft. This is the minimum value that we guaranteed for Okolite made with natural rubber.

WEATHERING: Samples of Okolite S insulated conductors without any coverings over the insulation, have been exposed to the sunshine and weather in our proving ground for the past nine months. The Okolite S insulation is still in excellent condition, its outer surface being practically free from checking, and it is equally as good as the Okolite made with natural rubber. We regard the behavior of Okolite S in this sunlight and weather exposure test as a good indication of stability and long life.

MOISTURE RESISTANCE: Tests were made on cable immersed in water for periods up to one year. We feel that our Okolite S insulation as now manufactured with Buna S is equal in moisture resistance to Okolite manufactured with natural rubber and possibly with further experience this can be still further improved.

The table below shows a comparison of important characteristics of Okolite S versus Okolite made with natural rubber. The results given in this table are as obtained in numerous tests made on the two compounds. It will be observed that there is no important difference in any of the properties covered by the table.

PROPERTIES OF OKOLITE INSULATION NATURAL RUBBER VS. GR-S

	Okolite (Natural Rubber)	Okolite S (GR-S)
Tensile Strength-p.s.i.	525	525
Elongation-inches	2 to 8	2 to 8
Resistance to Cold	Fair	Fair
Heat	Excellent	Excellent
Ozone	Excellent	Excellent
Oil	Fair	Fair
Sunlight	Good	Good
Flame	Poor	Poor
Moisture	Excellent	Excellent
Dielectric Strength-Volts/Mil	400-500	400-500
Insulation Resistance Constant (1000ft.,60°F)	15,000	14,000
Dielectric Constant (60 Cycle-80 Volts/Mil)	4.2	4.0
Power Factor-Per Cent (60 Cycle-80 Volts/Mil)	3.0	3.0

We can feel assured, as far as can be determined by such limited experience as we have obtained in 1 year of actual production, that Okolite S has all of the excellent properties and high quality of Okolite made with natural rubber.

OKOLOY Corrosion-Resistant Conductor Coating: Another important point in connection with Okolite S insulated wires and cables is the fact that the conductor coating is our standard Okoloy with which there have been many years of satisfactory service experience.

The above report is excerpted from a recent comprehensive report of the Research Laboratory of The Okonite Company, Passaic, N. J., manufacturers of insulated wires and cables.

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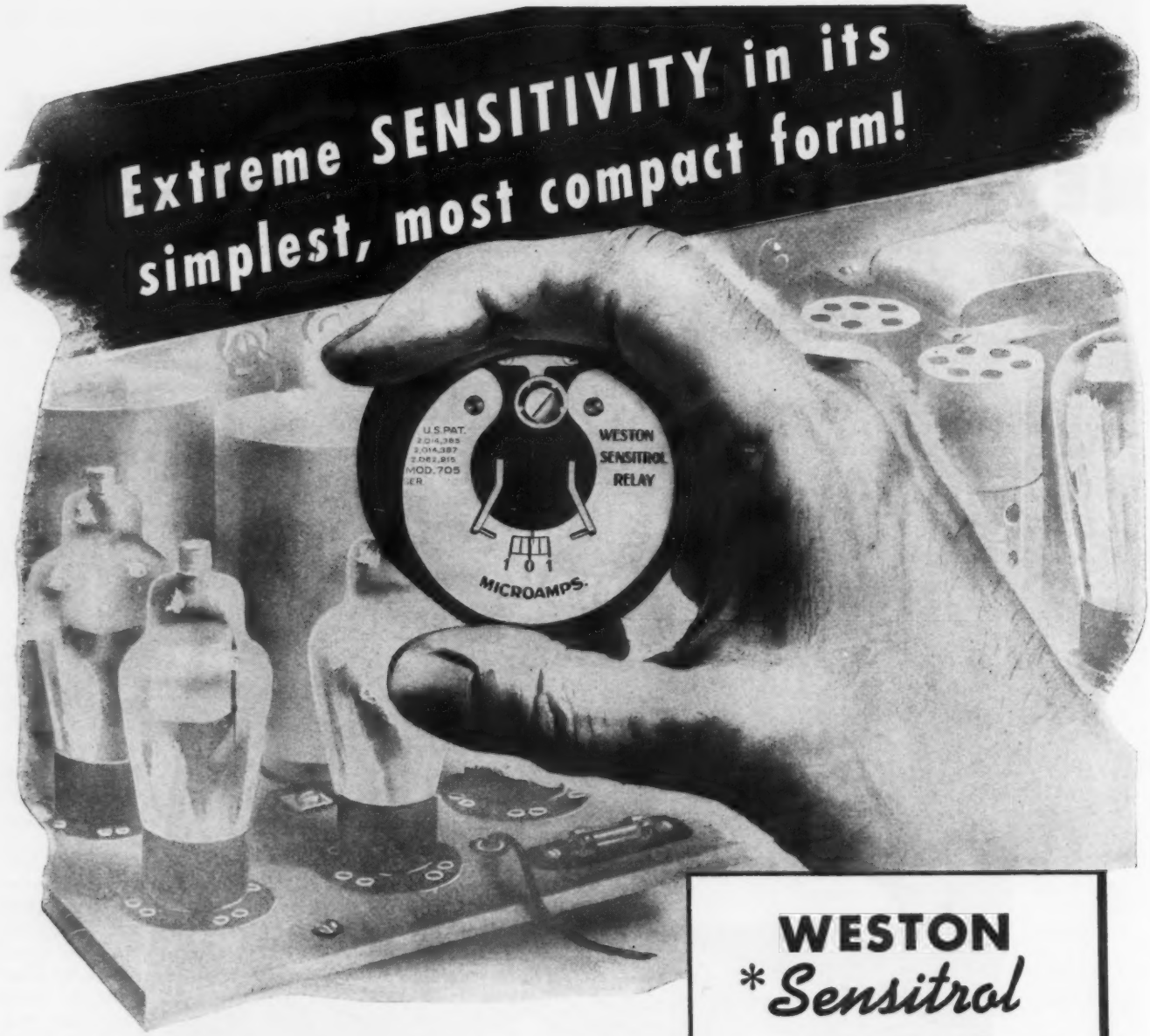

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The insulation of this wire is practically ageless, has high dielectric and mechanical strength, is flame retarding and is resistant to oils, acids and alkalies. In addition, Type SNW Flamenol wire insulation has low moisture absorption.

FOR FURTHER INFORMATION about Flamenol Building Wire or about G-E conduits or wiring devices, see the nearest G-E Merchandise Distributor or write to Section CDW1043-18, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

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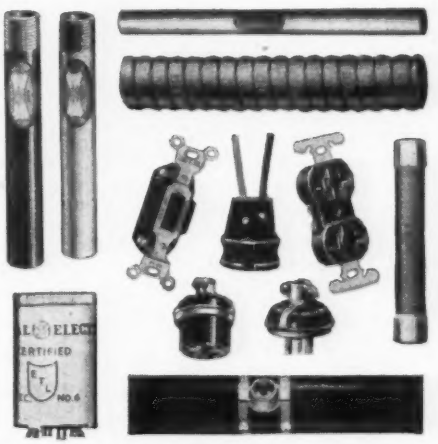

GREATER USE OF ELECTRICITY

Laurence W. Davis, general manager of NECA, Washington, D. C. says, "Adequate wiring is the essential key to unlocking the Home of Tomorrow. The post-war period will bring many advances in our living standards. Most of these advances will call for the greater use of electricity."

ADEQUATE WIRING SERVES AND SAVES — THE KEY TO THE HOME OF TOMORROW

ELECTRA'S HUSBAND

Salesman's Five-Foot Shelf

"THE Smith boy is out of the Marines," Electra said one night recently following one of the occasional family arguments over whether we should go out to see a movie which particularly intrigued me or stay home to listen to one of her favorite radio programs.

"What happened?" I asked. "I knew he had been in the hospital but I thought they would send him back out."

"His mother said it was a combination of the wound he got at Guadalcanal and some kind of tropical fever," Electra answered. "She said that if he hadn't been an officer, they might have kept him in for limited service. But an officer has to be fit to fight or he is out of the Marines. However, that's neither here nor there. What she wanted was some help from you."

"She flatters me," I said, reflecting the glow of pride that came with the knowledge that Mrs. Smith thought well enough of my judgment to ask for help. "What does she want?"

"Well the Marines gave the lad some kind of aptitude test which showed that he might make a good salesman," Electra continued. "You know he's the kind who likes people anyway. The idea seems to interest him. In fact his mother says that if the interest can be kept alive, it will relieve the hurt that he feels over being retired. Anyway because he must take things easy for a while, he wants to study. She thinks you might recommend some books which would help him."

"Lord, that's a big order," I said. "Did she have anything in mind?"

"Yes, she thought there might be some kind of a salesman's 'five-foot shelf' of books that he might begin reading," Electra said.

"There is and there isn't," I commented. "A lot has been written on selling and a lot of it is the bunk. I came across something just the other day which might answer the purpose, In fact I clipped it from the magazine I was reading and brought it home. It was a list of books compiled by Burton Bigelow for the salesmen of one of the large companies in this country. I'll get it for you."

I went over to the desk and began rummaging among some papers I had slipped into one of the drawers where my stuff is permitted to accumulate.

"Here it is. You can give it to her providing I get it back."

Before handing her the printed list, I sat reflecting upon the opportunities for the *good* salesmen in the postwar era, particularly in our electrical business. Yes, there will be opportunities such as perhaps never before existed. And there will be competition of a nature never dreamed about. Then I thought of how little real *selling* the salesman has had to do in the war years. Practically none. Will the salesmen have gone stale, I wondered? What can any salesman do to make himself a better salesman in the lush years to come? He can read and study just like any novice.

What had he ought to know to be successful in the postwar era? Basically, he should have the same knowledge possessed by all good salesmen. First and foremost need is an insight into people. He must be able to figure out what people want, how their minds operate and why they reach certain conclusions. Another prime asset is the ability to perfect the so-called "mechanics" of his job. Getting in, demonstrating, keeping the sale moving to the desired close—these things are never perfected and can always be improved. The same holds true for the salesman's most useful tools—words. New phrases that will persuade, better assurances, confidence-winning expressions don't come out of the air. They are sought after by study. Another important requirement is knowledge of product, of industry and of competition. And that does not come just from "exposure."

Such knowledge just isn't picked up; it must come from study. Hence the value of the list of books which Burton Bigelow mentions. Suppose a salesman—old or young in the game—were to spend just a little time each day studying for the future. what would he gain? A successful sales manager recently said that study would bring this knowledge to the salesman's day-to-day work:

"1. He learns more accurately what his customers feel, think and need.

"2. He learns sympathy and tolerance which, in turn, earn his customer's loyalty—and business.

"3. He knows what the job ahead entails. He knows what his goal is. He is ready for his opportunity.

"4. He is a bigger personality because reading has made people, and the world, more interesting to HIM.

"5. He is a better salesman, with greater earning power, because reading has given him 'know how' in not one, but many fields."

What the Salesman Can Read With Profit

Your Public Relations

1. Carnegie, "How to Win Friends and Influence People," Simon & Schuster.
2. Furnas, "How America Lives."
3. Carrel, "Man the Unknown," Harper.
4. Overstreet, "Influencing Human Behavior."
5. Worsham, "Art of Persuading People."

Your Job—Selling

1. Wheeler, "Tested Sentences That Sell," Prentice-Hall.
2. Bigelow, "Knack of Selling More," McGraw-Hill.
3. Worsham, "Low Pressure Selling," Midwest Press.
4. Borden, "Public Speaking as Listeners Like It," Harper.
5. Osborne, "Self-Management in Selling."

Your Business and Your Customer's Business

1. Livingston, "Markets After the War."
2. Shaw, "Approach to Business Problems."
3. Snyder, "Capitalism the Creator."
4. Cochran and Miller, "The Age of Enterprise," Macmillan.

The Salesman and the World

1. Beard, "Rise of American Civilization," Macmillan.
2. Bryce, "American Commonwealth," Macmillan.
3. Wells, "Outline of History," Garden City.
4. Willkie, "One World," Simon & Schuster.
5. Chase, "Goals for America," "Road We Are Traveling," Twentieth Century Fund.

Background for Success

1. Bennett, "How to Live," Hodder.
2. Link, "Return to Religion," Macmillan.
3. Emerson's Essays, Macmillan.
4. Radziwill, "Cecil Rhodes, Man and Empire Builder."
5. Werner, "Life of P. T. Barnum," Grosset.
6. Holt, "George Washington Carver," Doubleday.
7. Bond, "How to Give Yourself Background," Whittlesey House.

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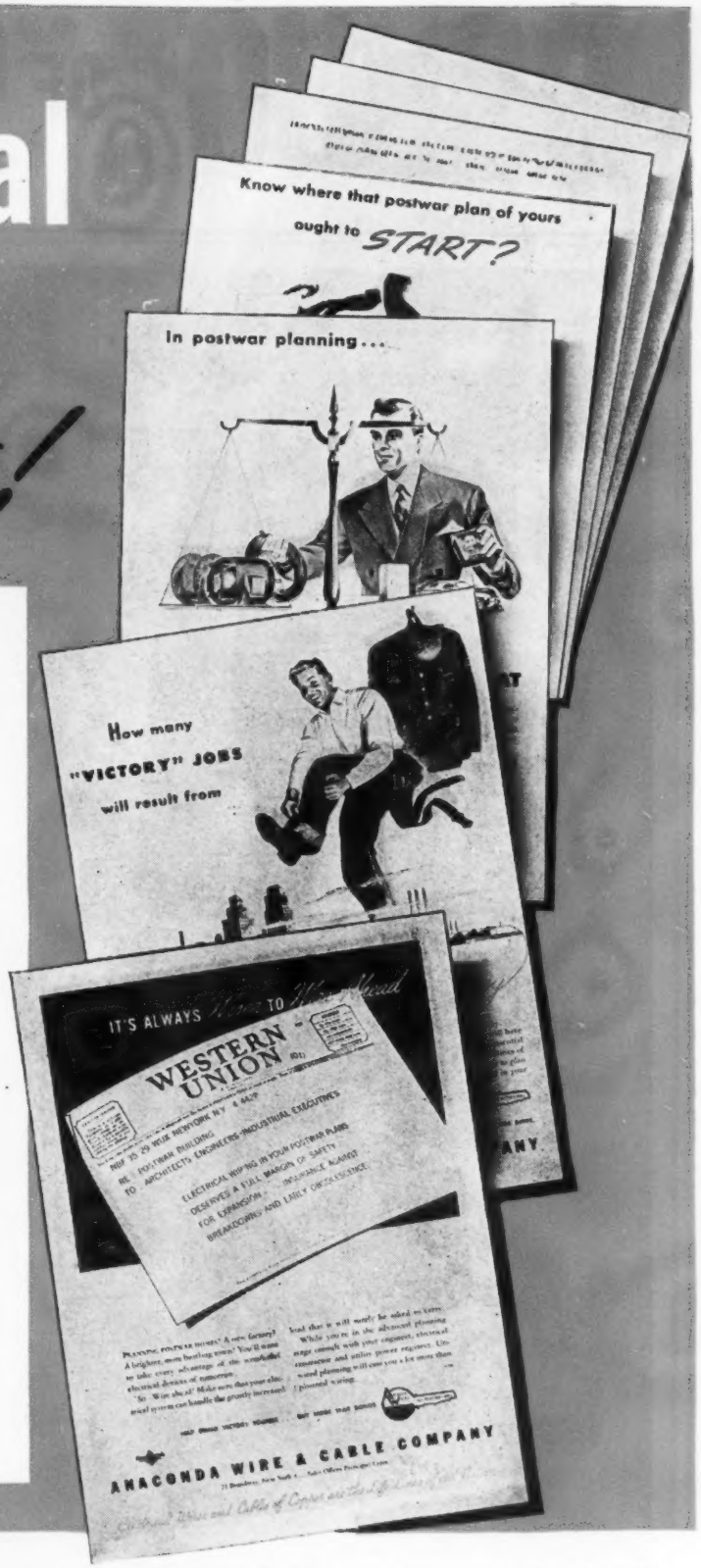
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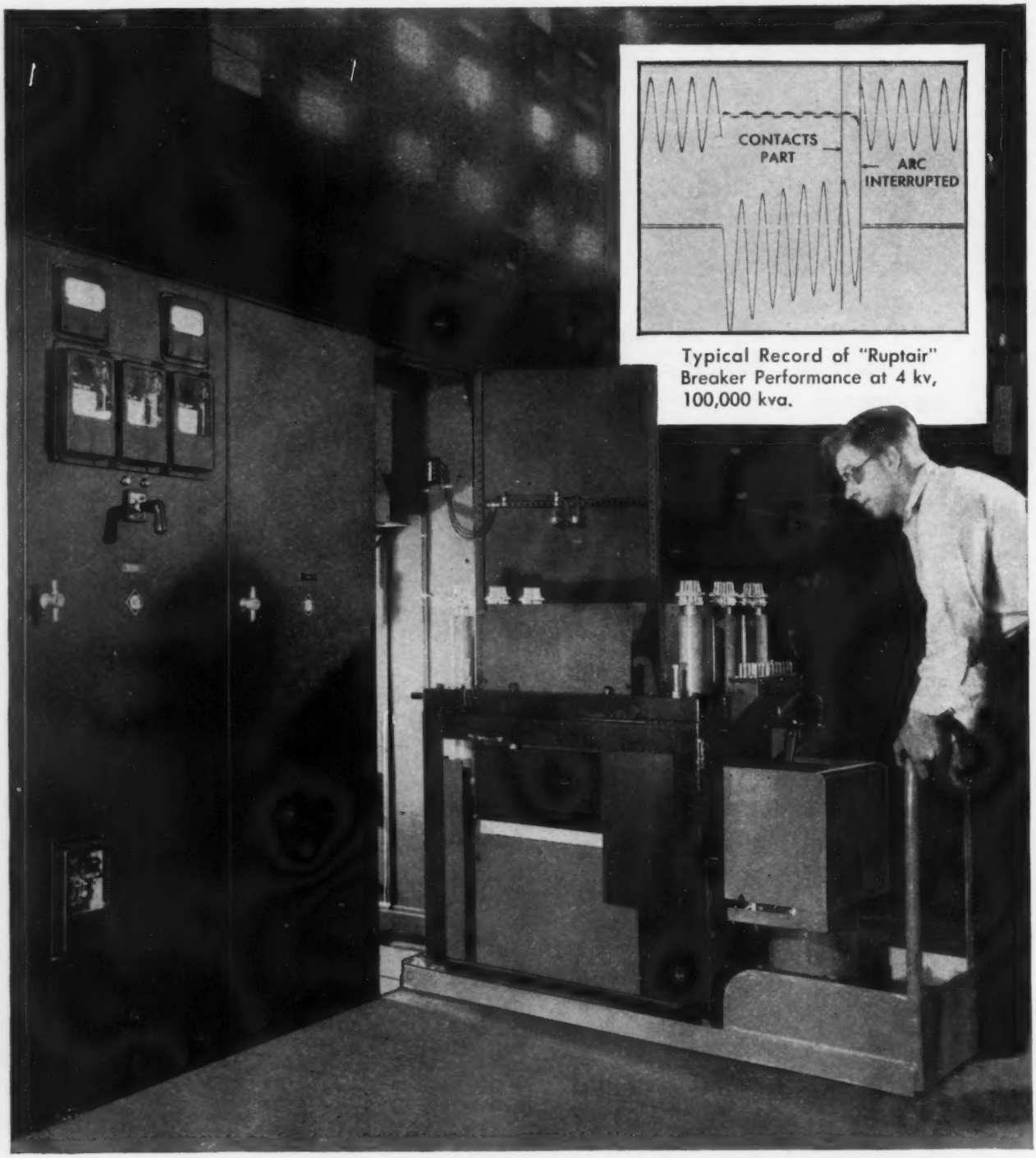

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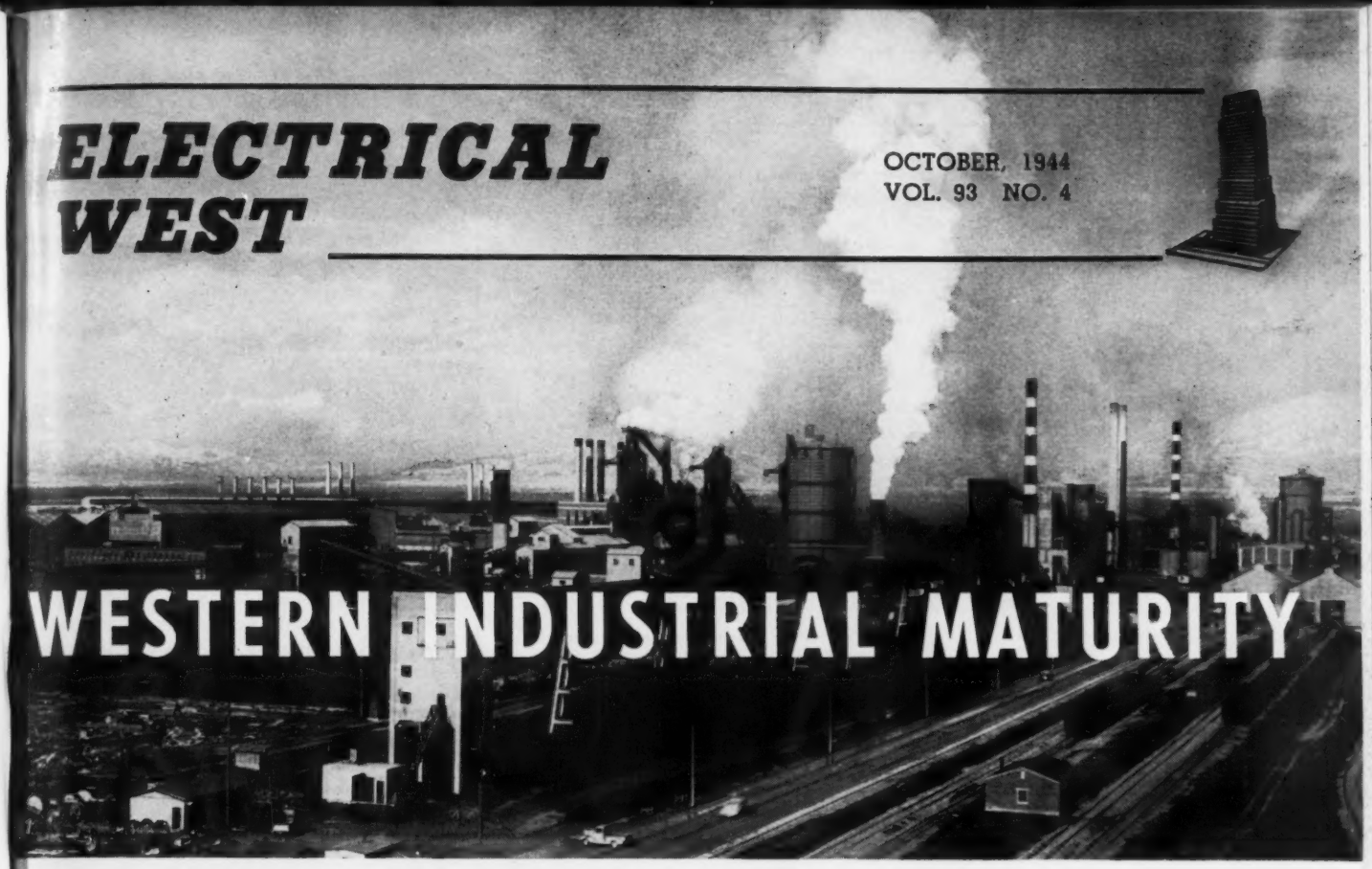
ELECTRICAL WEST

OCTOBER, 1944
VOL. 93 NO. 4



WESTERN INDUSTRIAL MATURITY

ALMOST axiomatic is the statement that no sound and stable industrial economy was ever set up on anything but a metallic base. Furthermore this base must have iron and steel as its principal components. Recognition of this truism is the basis for the certainty that the Far West will emerge from the war with a real opportunity for reaching industrial maturity.

Ability to produce iron and steel economically in large quantities in the face of competition from any other region, plus a huge capacity for the production of light metals coupled with great resources of other metals, provide assurance that the Far West will have industrial raw materials in abundance in the postwar era. Add to these factors the national trend toward industrial decentralization, the West's large supplies of electric power and fuels, a 16% increase in population since 1940, a war-industry trained pool of skilled workers and domestic and potential foreign markets sufficiently large to warrant mass production techniques and you have the foundation for the Pacific Coast's optimism over its industrial future.

War stimulated demands are responsible for the supplies of raw materials which will be available for peacetime uses. The aircraft industry's requirements for light metals brought the aluminum and magnesium plants to the West Coast. The needs of the huge ship construction program concentrated in West Coast yards brought about the steel installations at Fontana and Geneva. Postwar requirements of both of these great Pacific Coast industries will fall far short of absorbing the output of the plants which have been producing the steel and aluminum and magnesium to build war machines. However, new postwar applications for both heavy industrial equipment and consumers' goods will benefit from this available production capacity.

How great has been the wartime expansion and how may it be utilized? Various analyses have been made by experts. J. R. Mahoney, director of the Bureau of Economic and Business Research of the University of Utah, has studied the iron and steel situation. He recently declared:

"The wartime expansion of the steel industry in the West, chiefly through the construction of the Geneva and Fontana steel plants, holds the promise of being the most important step yet taken in the progress toward decentralization of heavy industry and will give the West an opportunity to achieve such industrial maturity as its resources and other factors may justify.

"The extent of these changes may be partially visualized if we keep in mind that while wartime construction has increased the blast furnace capacity for the industry as a whole by approximately 22%, the annual capacity of the West has been increased from 757,000 net tons to 2,715,000 net tons, and for the region of the Continental Divide, from 204,300 to 2,085,300 net tons annually. The steel ingot capacity for the region west of the Continental Divide is now 3,385,760 net tons as compared with 1,037,870 net tons before the war.

"Very large additions have also been made to the rolling mill facilities, chiefly in flat rolled products where a million tons of annual capacity has been added in the plate field alone.

"The steel finishing facilities established in the 11 Western states before the war were concentrated in a limited number of products. The most adequate provision was in the field of bars which were produced by nearly all of the steel mills of the West. Structural steel, both heavy and light, was the next most common product produced by Western steel mills. Next in order, from the point of view of the adequacy of rolling mill facilities to supply the Western market, were rails and other trackage supplies such as tie plates and splice bars.

"A very large and important subdivision of the steel industry that was left unprovided for in Western steel plants in the prewar period was in the rapidly expanding field of flat rolled products. The installations in the West were confined to a small capacity for hot rolled black sheets, hot rolled annealed black sheets and universal plates. The combined total of these mills gave the West a capacity of approximately 10% of the Western consumption of the total of all flat rolled products.

Table I—Pacific Coast Steel Consumption—1937 and Postwar and Steel-Mill Capacity

(Thousands of Net Tons)

	1937 Consumption	Estimated Postwar Consumption under Various Conditions					Steel Mills Capacity
		Normal	Extremely Favorable—Present Industries	Extremely Favorable—New Industries	Extremely Favorable—Export	Extremely Favorable—Total	
Semifinished products	18	22	24	...	...	24	...
Concrete reinforcing bars	150	185	202	...	2	204	330
Other merchant mill products	163	202	219	126	20	365	512
Standard structural shapes	87	107	117	33	19	169	425
Plates	185	229	249	58	54	361	906
Subtotal	603	745	811	217	95	1,123	2,173
Special sections*	41	51	55	...	...	55	...
Railroad products	154	190	207	...	22	229	40
Tubular products	381	470	512	13	32	557	...
Wire products	174	215	234	16	29	279	105
Sheet and strip	346	427	465	263	43	771	157
Tin plate	400	494	538	...	58	596	(†)
Other	30	37	40	25	...	65	...
Total	2,129	2,629	2,862	534	279	3,675	‡2,507

* Wide flange sections and sheet piling.
† Assuming that the tin plate facilities at Pittsburg will be idle or abandoned since they are now obsolete.
‡ Includes 32,000 tons of bolts, nuts, rivets and forgings, which are not considered as steel-mill products.
Source: Bernard E. Etcherverry, market analyst, Kaiser Co., Inc., iron and steel division.

"The building of the Geneva and the Fontana plants, with the preponderance of their capacity in the flat rolled field and the further fact that facilities already installed at Geneva are of the most modern continuous type found in the largest integrated steel plants, provides an entirely new basis for Western production in the future. The installed facilities at both these plants provide only for the rolling of plates in this field. Since the Western wartime need is for quantities far in excess of the installed capacity at both these plants, there was no occasion to go beyond this point for war needs."

Two different analyses of the possible postwar applications of the present steel capacity are presented in Tables I and II. Study of Table I shows a present over-capacity in the plate producing category with lesser over-production of bars and shapes. Totally lacking, however, are facilities for the production of tin plate and tubular products, both of which are consumed in quantity in this region. This table indicates a net deficit of approximately one million tons of capacity in the postwar period.

When one realizes that 75% of the weight of a plane is aluminum and that each pound of aluminum requires 10 kwh. of electric power in its production, then he appreciates the reasons for the location of seven aluminum pig producing plants in the Far West. Prior to the war there were but two. Aluminum production rates for the U. S. have expanded from 327 million lb. in 1939 to 2,100 million lb. in 1944, with one-third of this capacity located in the Far West. Here are the plants and their capacities:

Location	*Capacity (Millions of lb.)*
Vancouver, Wash.	150
Longview, Wash.	60
Troutdale, Ore	120
Spokane, Wash.	180
Tacoma, Wash.	40
Riverbank, Calif	90
Torrance, Calif.	150

The Vancouver plant, first to be located in the West, is an Aluminum Company of America property. Longview, the other prewar installation, belongs to Reynolds Metals Co. The Troutdale, Spokane, Riverbank and Torrance plants are the property of the Defense Plant Corp. and were operated by Alcoa for that organization. All of these producers use alumina as the base for producing aluminum metal. The Tacoma plant, a DPC installation operated by the Olin Corp., uses Utah alunite as a raw material. Columbia Metals Corp. is building a plant at Salem, Ore., to experiment on the recovery of aluminum from Oregon and Washington clays.

What will be done with the war-born surplus aluminum capacity and what place will this metal occupy in the postwar economy? Walter A. Janssen, chief of the metals and minerals unit of the Bureau of Foreign and Domestic Commerce, has this to say:

"What to do with this tremendous capacity after the war? Ironic as it may seem, the answer to that poser may be far more difficult and take longer to solve than did the expansion of production from 327,000.000 lb. to 2,100,000,000 in three short years.

"Obviously, the industry cannot immediately utilize in peacetime this mushroomed wartime plant. Airplanes will doubtless yield to other products of the transportation industry, which has been the largest single consumer of the metal. Aside from aviation, no other single activity was developed during the war which would be stamped as an outstanding postwar outlet.

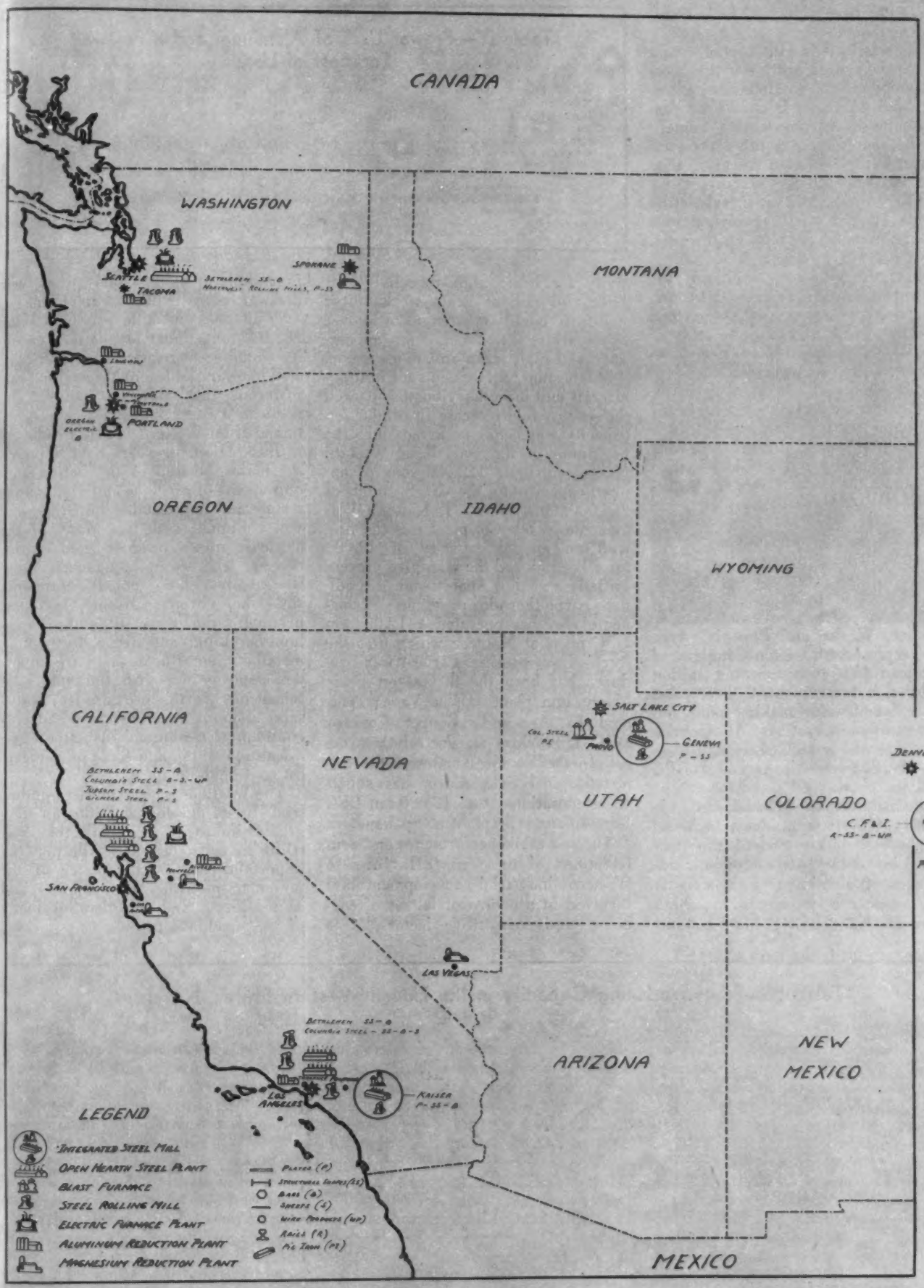
"But civilian suppliers, denied the opportunity of obtaining aluminum at 15 cents per pound because of wartime restrictions, may already have developed plans for utilizing surprisingly large tonnages.

"Various estimates have been made concerning postwar uses. Wild tales have been told about how this versatile metal is going to replace abnormally large tonnages of both ferrous and nonferrous metals. In this connection, it is well to remember that the history of metals reveals no single metal ever replacing another simply because it was in abundant supply. In fact, the economic position of all

Table II—Fields in Which Greatest Opportunities Exist for Expansion of Western Iron and Steel Industries

Industry	1939 Value of Production		1939 Production Value
	United States	Eleven Western States	11 Western States Per Cent of U. S.
Automobile stampings	$ 47,833,000	X	X
Blast furnace products	550,802,000	X	X
Bolts, Nuts, Rivets, Washers (Not made in rolling mills)	84,118,000	$ 485,000	0.6
Cast iron pipe and fittings	65,079,000	2,622,000	4.0
Cutlery and edge tools	59,924,000	123,000	0.2
Firearms	17,712,000	X	X
Forgings, iron and steel (Not made in rolling mills)	104,883,000	3,221,000	3.1
Hardware	154,476,000	3,960,000	2.6
Heating and cooking apparatus (Except electric)	20,330,000	535,000	2.6
Malleable iron castings	53,451,000	X	X
Screw machine products and wood screws	82,807,000	1,625,000	2.0
Stamped and pressed metal products (Except autos)	178,395,000	7,361,000	4.1
Steam and hot water-heating apparatus	45,378,000	X	X
Steam fittings	111,985,000	2,302,000	2.1
Tools (Various hand tools, except cutting)	75,290,000	1,446,000	1.9
Wire Drawn from purchased rod	176,503,000	3,153,000	1.8
Wirework	158,817,000	10,366,000	6.5

X represents production so small that data were withheld to prevent disclosure of individual operations, or percentage so small as to be of no significance statistically.
Source: Industrial study by Los Angeles Chamber of Commerce.



Basis for the West's new industrial revolution are the strategic metal producing facilities shown on the above map. There are three locally integrated steel mills, six additional open hearth plants with rolling facilities and two electric furnace plants with rolls. Coupled with these are seven aluminum and four magnesium producing plants

metals has been enhanced by a transcendent one.

"Therefore, it is quite possible that the postwar uses will, for the most part, represent a continuation, extension, and a balancing out of the prewar pattern. A considerable tonnage will be represented in those products which were restricted because they were less essential for the war.

"The accompanying tabulation (Table IV) shows the principal uses of aluminum by industry in the past, and a postwar forecast."

"Over-all tonnage estimates for postwar demands vary greatly. In fact, the stated amounts and the described methods of retention and allocation of the potential capacity, in a few instances, border on the ludicrous.

"But among all estimates expressed, the figure 900,000,000 lb. is heard most often. Strangely enough, this is a little more than one-third of our wartime capacity and a little less than three times the peak peacetime production in 1939, which took us 50 years to attain."

Fabricating capacity capable of supplying potential Western users of aluminum with a variety of raw materials suitable for almost any kind of product exists at Vernon, Calif., Spokane, Wash., and Phoenix, Ariz. At Vernon the Aluminum Company of American has extrusion and tubing facilities, a forge plant, a rivet plant and a foundry for making sand and permanent-mold castings. At Spokane Alcoa operates a DPC sheet and plate mill. At Phoenix Alcoa runs a DPC extrusion plant.

Opportunities for producing a wide variety of postwar products in Western plants should be evident from consideration of the twelve economic advantages of aluminum: light weight; high resistance to corrosion; high electrical conductivity; high conductivity for heat; high reflectivity for light and radiant heat; workability; non-toxic qualities; strength of alloys; non-sparking; non-magnetic; appearance and high scrap and re-use value.

Magnesium requirements for military aircraft and incendiary bombs sparked the seventy-fold increase in production capacity which has occurred since the beginning of the war. Four Western plants contribute 122,000 tons of annual capacity to the U. S. total of 265,000 tons. Henry J. Kaiser's Permanente Metals Co. plant was the first with an annual capacity of 12,000 tons. It employed the Hansgirg process initially and now operates on a modified carbo-thermic principle. Permanente also has operated a 12,000-ton DPC plant at Manteca which uses the ferro-silicon process. Largest war producer has been the 80,000-ton Basic Magnesium plant at Las Vegas operated by Anaconda Copper Co. for DPC. It employs an electrolytic process. In the Pacific Northwest Electrometallurgical Sales Corp. has supervised operations at an 18,000-ton DPC ferro-silicon type plant at Spokane.

The peacetime performance and contributions of these installations to Western industrial development are involved in a controversial set of economic and competitive factors. It is impossible to predict today what their postwar place will be. In terms of over-all basic metallic production the 265,000-ton annual magnesium capacity would seem relatively insignificant.

Whatever additional metallic raw materials that may be required by postwar Western industries can be obtained from Western mines. Producers in this region for years have supplied the major portion of the nation's requirements of precious and non-ferrous metals and non-metallic minerals, and will continue to do so. Many of the strategic mines produce gold, silver, copper, lead, iron, manganese, tungsten, molybdenum, cobalt, antimony, tin, zinc, chrome, arsenic, mercury, uranium, vanadium, titanium, tantalum, beryllium, and zircon. In the nonmetallic mineral field, there are important deposits of potash, fluorspar, diatomaceous earth, magnesite, silica sand, dolomite, various clays and ores containing aluminum, asbestos, vermiculite, helium, and some of the largest coal fields in the U. S.

The West has a new frontier—industrial. In its development into an integrated industrial economy the electrical industry can and will play an important part as a supplier of the power to motivate the machines and as producers and installers of many of the machines themselves.

Table IV—Prewar Uses of Aluminum and a Postwar Forecast of Uses

Industry	Percentage of Use Nov. 1939	Dec. 1940	May 1943	Postwar
Transportation	29	40	63	34
Cooking utensils	14	6	1	10
Electrical conductors	10	5	0	8
Machinery and electrical appliances	15	9	6	12
Building construction	8	5	3	9
Chemical	5	5	5	5
Foundry and metal-working	4	23	19	9
Ferrous and nonferrous metallurgy	5	4	2	4
Food and beverages	6	2	0	5
Miscellaneous	4	1	1	4

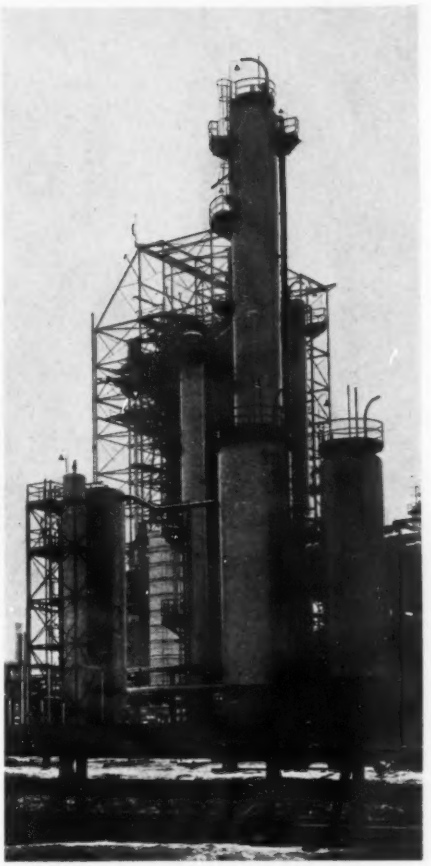
Table III—Steel Producing Capacity in the Eleven Western States, Net Tons

		OPEN HEARTH No.	OPEN HEARTH Capacity	ELECTRIC No.	ELECTRIC Capacity	TOTAL No.	TOTAL Capacity
CALIFORNIA:							
Bethlehem Steel Co.	Los Angeles	4	117,000	..	.....	4	117,000
Bethlehem Steel Co.	San Francisco	5	235,000	..	.....	5	235,000
Judson Steel Co.	Oakland	3	86,720	..	.....	3	86,720
Kaiser Co., Inc.	Fontana	6	675,000	..	.....	6	675,000
*National Supply Co.	Torrance	..	.....	3	45,900	3	45,900
Pacific States Steel	Niles	..	.....	3	86,400	3	86,400
Columbia Steel Co.	Pittsburg	7	375,200	1	11,400	8	386,600
Columbia Steel Co.	Torrance	4	201,400	1	9,600	5	211,000
TOTAL — CALIFORNIA		29	1,690,320	8	153,300	37	1,843,620
WASHINGTON:							
Bethlehem Steel Co.	Seattle	5	210,000	..	.....	5	210,000
*Isaacson Iron Works	Seattle	..	.....	2	75,000	2	75,000
Northwest Steel Rolling Mills, Inc.	Seattle	..	.....	2	32,400	2	32,400
TOTAL — WASHINGTON		5	210,000	4	107,400	9	317,400
COLORADO:							
Colorado Fuel & Iron	Pueblo	16	1,121,000	..	.....	16	1,121,000
OREGON:							
Hesse-Herstad Co.	Portland	..	.....	2	60,000	2	60,000
UTAH:							
Geneva Steel Co.	Geneva	9	1,300,000	..	.....	9	1,300,000
TOTAL — 11 WESTERN STATES		59	4,321,320	14	320,700	73	4,642,020
TOTAL — UNITED STATES		981	83,351,260	236	6,248,470	1,252	95,948,030
PERCENTAGE WESTERN TO U. S. CAPACITY		6	5.2	6	5.1	5.8	4.8

NOTE: No Bessemer processes in the West; total in U. S., 35 units; capacity 6,074,000.
*Forging plants only — no rolled steel.
Source: Builders of the West, Inc.

Richfield's New Refinery

$20,000,000 addition at Los Angeles plant to produce 100-plus octane gasoline contains all-underground distribution with new 11-kv. feeders



ELECTRICAL applications in an oil refinery have one basic requirement not found in most other types of industrial plant—everything must be explosion proof. This applies to every single item of equipment that goes into the electrical installation. Motors, control, switches, lighting units and other devices must be of the explosion proof type or some provision must be made to prevent accumulation of explosive gases because of the hazardous nature of making petroleum products.

The problem is of especial importance in a refinery that is producing 100-plus octane aviation gas, such as the new $20,000,000 addition to the Richfield Oil Corp. plant at Watson, Calif., near Los Angeles. Continuity of service and dependability of equipment are other factors of prime importance. In these respects the new Richfield plant is exemplary.

The power company substation has three sources of 11,000-volt supply with ring bus protected by differential relaying that will immediately drop any one or two of the supply lines that may be in trouble without affecting operation of the plant. To provide maximum reliability and freedom from hazard, all 2,300- and 11,000-volt circuits radiating from the substation are carried in underground lead-covered cable. In fact, the entire electrical wiring system at Richfield is underground and it is said to be the only major refinery in the country so provided.

Power Distribution

To bring out some of the interesting features at Richfield, power supply will be traced briefly from its point of origin to points of utilization. Entire power supply is purchased from the Southern California Edison Co. at primary metering. The 9,000-kva., 11,000/2,300-volt substation formerly supplying the old plant was purchased by Richfield from the Edison company at the time of the new addition in order to permit the customer to avail himself of the advantages of primary metering. Additional power supply brought about problems of interrupting capacity of oil circuit breakers in the older part of the plant. New conditions would impose an interrupting capacity requirement of 100,000 kva. on breakers, yet the old breakers were rated at only 25,000 kva. One of two things had to be done, either the old breakers had to be replaced or the duty to be imposed upon them had to be reduced. The latter solution was deemed preferable and accordingly a bank of reactors as shown was installed in the secondary or 2,300-volt leads of the 9,000-kva. transformer bank. Voltage regulation is naturally poorer, but this has not proved serious largely because the power company's supply has voltage regulation at its sources.

From the main substation, two 11-kv. feeders extend underground to a substation within the plant from which distribution is made for the additional 2,300 kw. of load added by the new "Thermofor" catalytic cracking, alkylation and fractionation units. Power is distributed to the new units through three new substations. No. 1A is provided with three 1,000-kva., 11/2.3-kv. outdoor transformers with necessary switching equipment. Power at 2,300 volts is carried to a No. 18 substation for distribution through metal-clad, vertical lift switchgear to the "Thermofor" catalytic cracking unit, the new addition to the alkylation plant, the old alkylation plant and a new steam boiler plant. An 11-kv. supply is also carried to this substation designated as No. 18 for transformation to 440 volts by two 500-kva., indoor, metal-clad transformers. In this same substation provision was made for lighting the new units by three 100-kva., 2,300/120/240-volt, single-phase transformers.

For a new water cooling tower, pump house and water well, power and light is supplied from a No. 20 substation housing two 300-kva., 11,000/440-volt, three-phase, indoor type, metal-clad transformers and switchgear. Lighting is taken from the 440 by a 15-kva., dry type transformer mounted in a spare metal cubicle of the switchgear assembly. This substation is fed from station 1A by an 11,000-volt 4/0 cable.

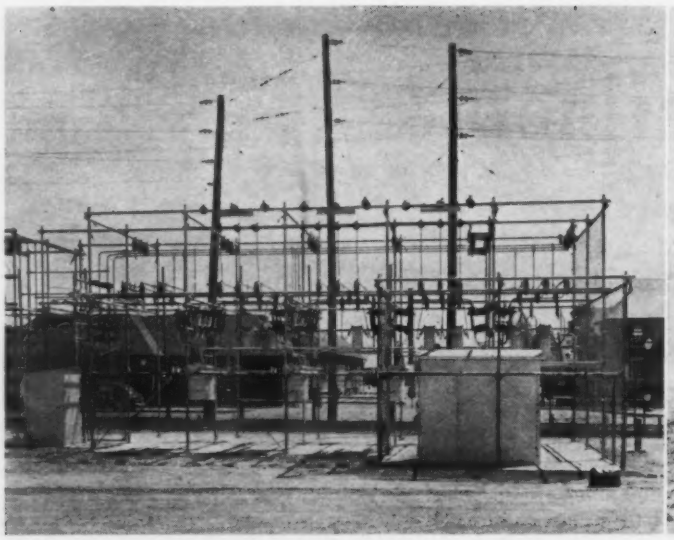
Protection for all electrical equipment has been given considerable attention. The 11,000-volt circuit breakers are of 150,000-kva. interrupting capacity with d-c solenoid closing and d-c trip. Breakers for 2,300 volts are rated 50,000-kva. interrupting capacity, also with d-c solenoid closing and d-c trips.

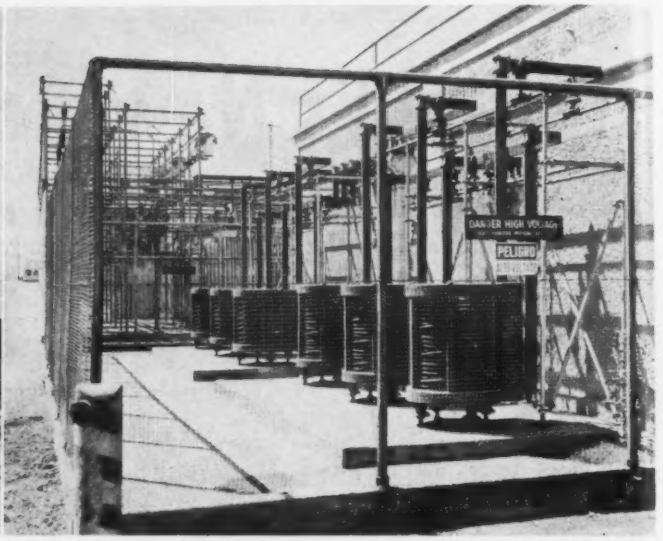
All parallel feeders are protected by pilot wire relays. The 440-volt equipment has 2,300-volt, rated circuit breakers and air-break disconnects. Current overload protection with d-c tripping is used on such breakers. D-c is supplied by storage batteries located in 1A and No. 18 substations.

Underground Distribution

Power is distributed throughout the refinery by an underground system, as previously mentioned. Tile duct laid in concrete is used for the long runs, and black enameled conduit for the short runs between manholes and switchhouses. Conduit is also used for carrying cable in an operating area. All cables are lead covered. Those for 11,000-volt service are rated at 15,000 volts, three conductor, compact sector, and shielded paper insulated, while those for 2,300-volt service are rated at 5,000 volts, three conductor, compact sector and paper insulated. All secondary cables are rated at 600 volts, single conductor and varnished cambric insulated.

The lead sheaths of the cables are grounded at each manhole through a 4/0 cable which is installed in the concrete envelope below the tile duct.





Three sources of 11-kv. supply provide amply for continuity of service at main substation (left). Expense of replacing old 25,000-kva. interrupting capacity circuit breakers in old section of plant was obviated by installing reactors (right) to reduce duty imposed

This ground cable is brought out at each manhole and terminated at each substation to a copper ground plate set at permanent ground water elevation.

Pumps, motors, tanks, pressure vessels, heat exchanger and structures are grounded to one common grounding system. At each substation, a water pipe ground has been provided in addition. All switchgear is connected to this water pipe ground as well as to the aforementioned common ground.

Explosion Protection

All motors, controls, panelboards and lighting equipment are of the explosion proof type as previously mentioned. Several of the accompanying photographs show typical installations. In two of the substations located in critical areas a different means of protection had to be resorted to because of the high cost and the almost impossibility of making explosion proof switchgear, switchboards, relays and related equipment.

Here the problem was solved by maintaining a slight positive pressure within the building with an uncontaminated air supply drawn from the atmosphere high above the building and kept under pressure by two ¾-hp. centrifugal fans. This feature is brought out in one of the accompanying photographs. Air escape from the room is by means of gravity type, telltale louvers set in the walls of the room near the floor line.

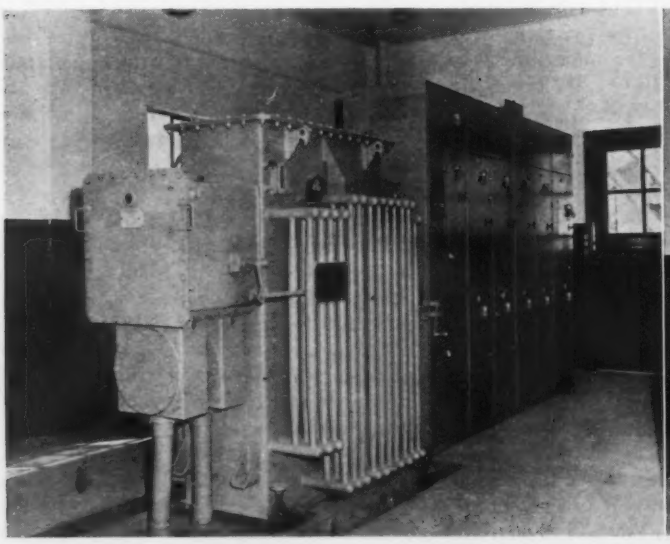
Notwithstanding the high degree of reliability of power supply to the Richfield plant, it is necessary to provide emergency service for lighting, certain vital pumps and oiling systems. For this purpose there are six small capacity steam turbine-driven, a-c generators, one of which is here illustrated. Upon no-voltage relay tripping these machines will start and pick up load in from 1½ to 3 seconds.

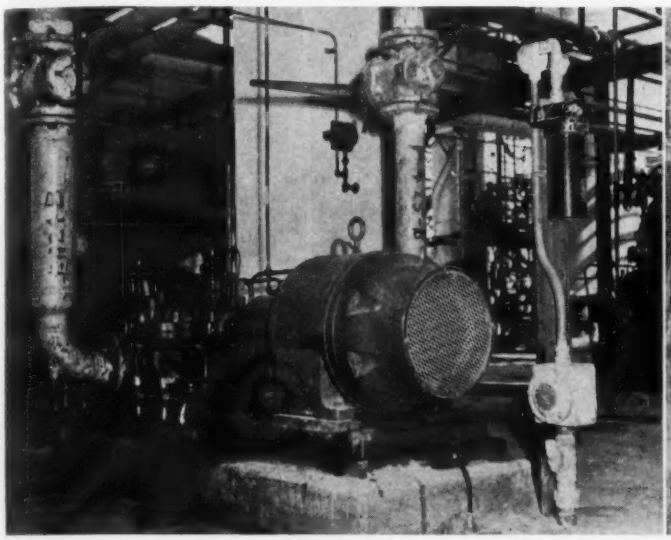
Insurance against shutdown of certain large pump motors from power disturbance or low-voltage conditions, also has been made. Such motors are provided with special low-voltage controls that keep them in operation until the voltage has dropped to a predetermined value so low that the motors will stall.

Steam Boiler Plant

Large quantities of steam are needed around an oil refinery and to meet additional steam requirements of the new units there has been provided a modern boiler plant with several noteworthy features. The boilers are semi-enclosed and only boiler fronts and pumps and control and instrument

New substations are modern metal-clad jobs with truck type switchgear. The one at the left contains two 300-kva. metal-clad transformers with ten 440-volt air circuit breaker protected feeders. Sub at right is made explosion proof by maintaining positive air pressure. Escape is by gravity type louvers





Motor and connections (left) is typical of explosion-proof equipment. At right is an explosion-proof Crouse - Hinds breaker type lighting panelboard. In upper right corner of this view may be seen also a 100-amp. 440-volt portable welder explosion-proof receptacle

board are housed. The boilers themselves, together with pressure reducing stations, fans and de-superheaters, are outside. The plant was designed and built for Richfield by The Lummus Co. and includes in addition to the semi-outdoor construction, two innovations of interest to operating men.

First, the steam piping is so arranged that all valves and regulators can be reached from the floor without the use of platforms or ladders. Second, all pumps, with the exception of the boiler fuel pumps, are located in a straight line in the pump house which extends across the front of the boilers. The boilers are equipped with Peabody combination gas and fuel oil burners, and operate at 600 psi. and 750° F. total temperature.

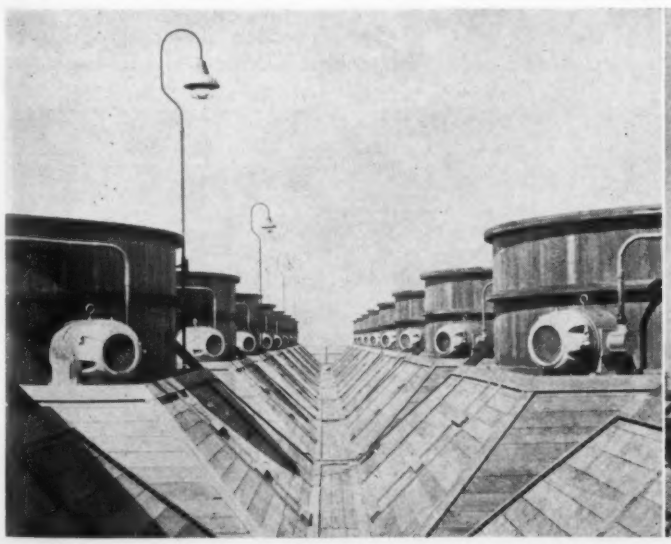
Refining Process

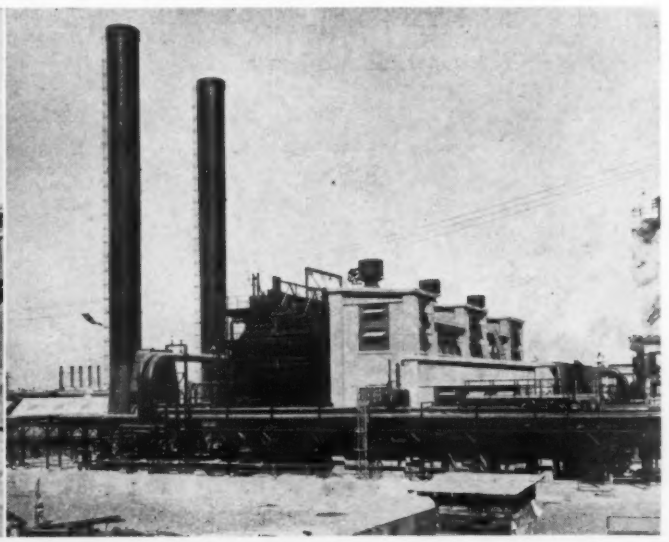
Richfield's new additions will increase by more than tenfold its production of 100-octane gasoline in 1940, when this company first started production of this super-fuel. Richfield was the first refinery in southern California to manufacture 100-octane gasoline, long before the war started, and with the new units in operation, will have an output of approximately 20,000 bbl. daily in 1944.

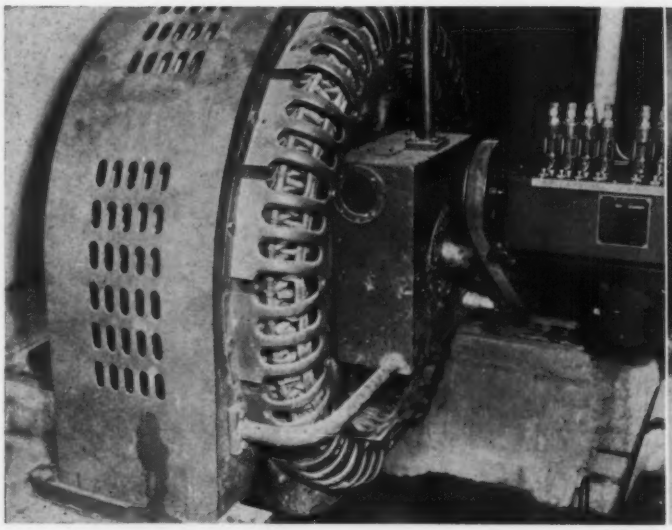
The process used embodies all the latest developments of the petroleum industry, including use of the revolutionary bead catalyst. Developments during recent years, and particularly during the war, have made possible doubling the gasoline output of every barrel of crude. It is now possible to produce gasolines of such high quality that motors have not yet been designed to utilize all the fuel-power that is available. Although present aviation gasoline is of 100-octane rating, there is no practical limit to going to much higher octane values, possibly up to 200. Automobile engines will, of course, have to be re-designed for use of these higher octane fuels. Present engines would either become gas locked, or the head would be blown off the motor.

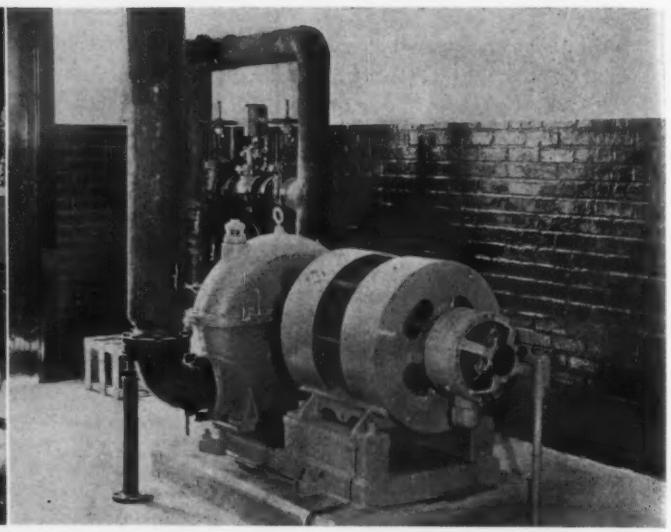
Two war developments of the research laboratory are both being produced by Richfield. When added to high octane gasoline they make it a super-super fuel. One is known as Cumene. It is compounded synthetically from benzine and other petroleum hydrocarbons, and when added to lower grades of gasoline will bring up their power rating to aviation specifications. Cumene has done more than increase aircraft performance. When used as a blend it provides superior power for take-off, climbing and dogfighting. It gives an extra surge of power when altitude is needed in a

Large horizontal fans in new cooling tower (left) are driven by shaft extension and beveled gears by eighteen 30-hp. 440-volt, explosion-proof motors. Richfield's new modern steam boiler plant (right), containing several noteworthy features, is of the semi-outdoor type. Either oil or gas may be burned





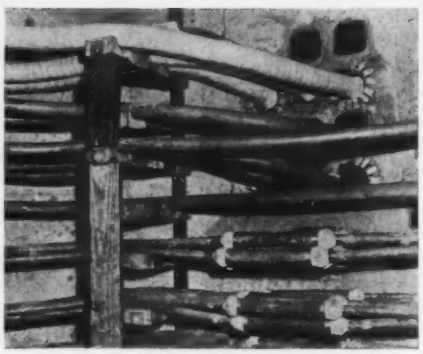




Collector rings on synchronous motor (left) are housed under air pressure to prevent explosion. Quick starting turbine-driven emergency generator (right) supplies lights and vital pump motors. One of the vaults (center) for cables is underground distribution system

hurry, which may mean life to a combat pilot.

Another super-fuel concentrate necessary for extra power is Alkylate, a blending agent that has added hundreds of miles of range to bombing and fighter planes. Alkylate is also a super-fuel, too powerful for present motors, yet an invaluable asset to aviation base stock produced in other refining operations. Iso-butane, a product of an isomerization unit, is combined with other hydrocarbons in the presence of extreme cold and sulphuric acid to form Alkylate. It is



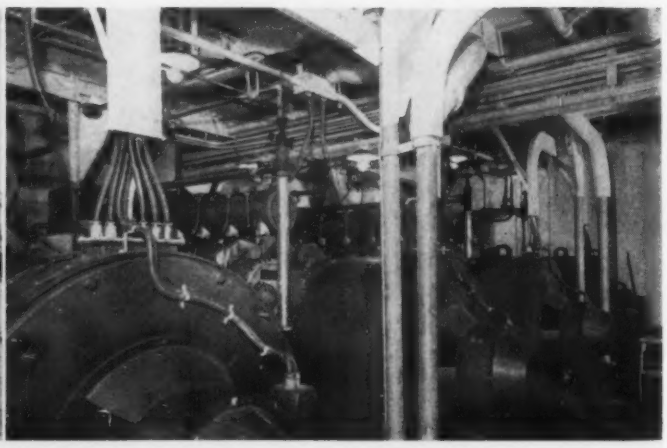
Alkylate that has pushed back the barriers of distance and enabled American fliers to bomb Berlin and Japan from bases well within territory controlled by the United Nations. It has enabled fliers to throttle down, permitting greater cruising range.

Another important step in the production of super-octane gasoline is the fractionation process. It is here that pure iso-pentane, one of the most powerful substances known, is separated from the complex mixture of other hydrocarbon compounds found in petroleum.

These startling new developments that have taken place within the oil industry will result in many benefits in the postwar era. Probably the most important of these will be the tremendous saving in the nation's oil reserves. In addition to a finer grade of gasoline, better and more economical diesel and lubricating oils also will be available when the war is over.

With such production facilities as Richfield's and those of other major oil companies, the public is assured the benefits of all these new developments, postwar, but in every octane of the 100-plus, there will be a trace of the master "Catalyst" of all—the kilowatt-hour — basic "ingredient" of all manufacturing processes.

Latest in the way of auxiliary power plants is the power barge Electra (below) built for the U. S. Army Engineers at Alameda, Calif. Eight 16-cylinder, two-cycle diesel engines, each drives a 750-kva., 2,400-volt generator. Power is stepped up to 12 kv. for transmission to shore by submarine cable. Col. Robert C. Hunter, Sacramento district engineer, states that, although all electrical equipment for the barge was designed and installed under the direction of his office, the ship itself was built at San Francisco under direction of the Pacific Division U. S. Engineers



Geneva—Steel's Most Modern Plant

Free latitude in design made the West's latest integrated steel mill a "last word" in steel mill practice. World's largest supervisory control, amplidynes and all-underground distribution are features

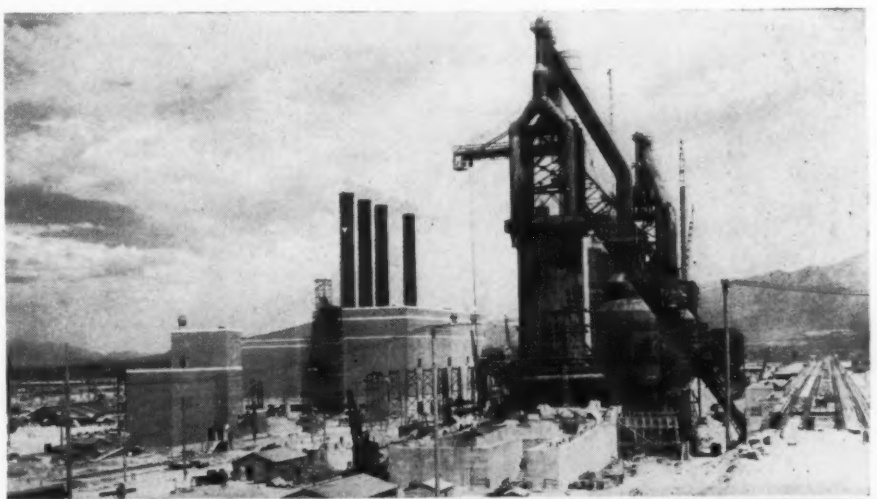
LOCATED on the shores of Utah Lake, some forty miles south of Salt Lake City, is the Geneva steel plant, America's most modern integrated steel producing unit. The plant was built by the government as a wartime urgency to supply additional steel plate and structural shapes vitally needed by Pacific Coast shipyards in the prosecution of the war. Many noteworthy features of electrical construction are embodied in this project, which are of proved soundness and economic worth. These include a complete underground loop distribution system and use of higher voltage (13.8 kv.), supervisory control of all main units, amplidyne control on main mill drives, automatic pulpit control, electrostatic air cleaning and other features to be covered later.

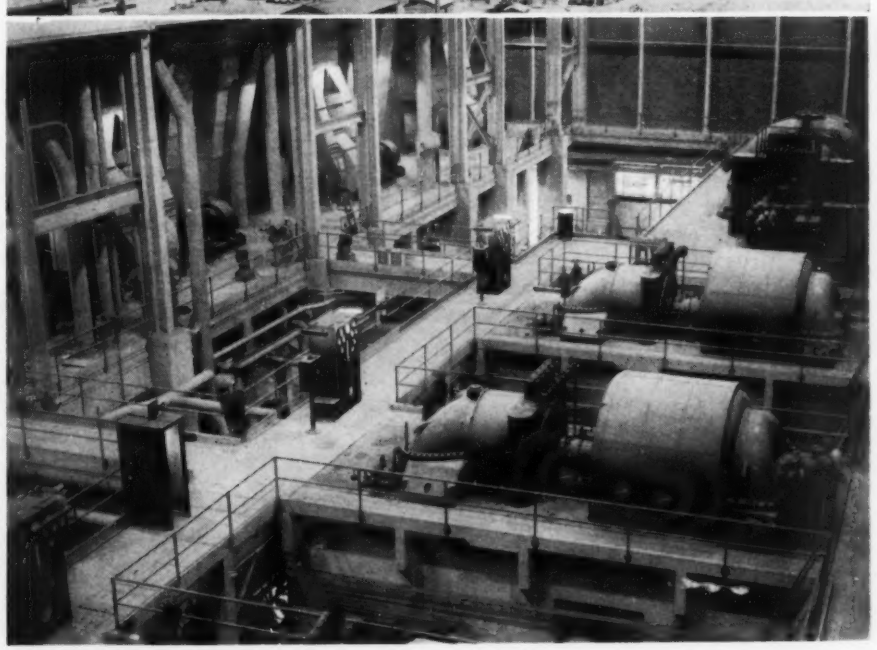
Geneva was built by the Columbia Steel Co., subsidiary of U. S. Steel Corp., for the Defense Plant Corp. and is being operated by Geneva Steel Co., also a U. S. Steel Subsidiary. The plant, costing approximately two hundred million dollars, is a complete steel producing unit from raw materials to finished product, with rated capacity of 1,283,400 tons of steel ingots per year. The fact that the plant is ideally located to serve the Western market and that it will be *competitive* in production cost, would seem to point to postwar operation. Geneva marks another milestone in the forward march of the West industrially.

The 1,600-acre site on the shores of fresh-water Utah Lake was almost ideal from every standpoint. It permitted great latitude in layout of facilities for streamlined material flows. The site, too, was ideal from the standpoint of the purpose to be served by the plant, being about equi-distant in terms of freight rates from the Pacific Coast industrial and shipbuilding centers of Los Angeles, San Francisco and Portland-Seattle. Fortunate, also, was the fact that all of the raw materials or "ingredients" required in the making of steel were comparatively nearby.

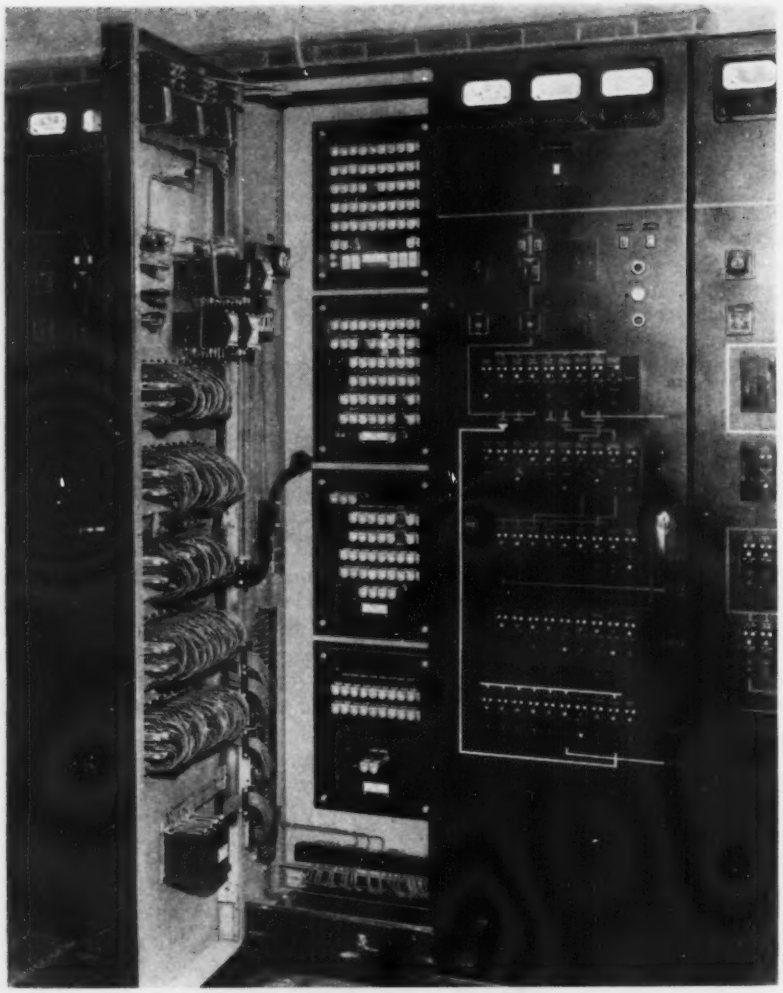
Iron ore comes in by main-line Union Pacific Railroad from open pit workings near Cedar City, Utah, a distance of 225 mi.; coal of sub-bituminous grade is obtained near Price, Utah, and shipped by main-line Denver & Rio Grande Western Railroad 130 mi. to the steel mill; limestone and dolomite, used as fluxes in blast furnaces and open-hearth furnaces, come from Payson, about 25 mi. from Geneva. Water, another "ingredient," is available in adequate quantity, and fortunately at fairly low temperature —a distinct asset. All of these fortunate circumstances were combined at Geneva with another factor of equal or greater importance—that of an all-year operating climate for all sources of raw material — something steel plants of the East are not blessed with, because of their seasonal ore supply and storage problems.

The Geneva steel plant has three blast furnaces, nine open-hearth furnaces, a 45-in. blooming and slabbing mill and a 132-in. wide semi-continuous plate mill capable of turning out 700,000 tons of finished product annually, and a 26-in. structural mill that will produce 200,000 tons of various structural shapes, billets and bars yearly. With these major facilities are all the others that go to make up an integrated operation, such as the coke ovens and associated equipment for





Turbines and boilers housed in one large room at Geneva saved building costs. 50,000-kw. generator is shown



World's largest industrial supervisory control system saves labor, eliminates excessive peaks and aids in maintaining production schedules. All substations and main drives are under supervisory control

making by-products, sintering plant, self-sufficient maintenance shop, locomotive terminal, power plant, offices.

Power Plant

The power plant, designed by Sargent & Lundy, of Chicago, is similar to one constructed some years ago at another of U. S. Steel's plants. It contains five Babcock & Wilcox boilers, two rated at 150,000 lb. of steam per hour; and three at 300,000 lb. per hour, 475 psi., and 760°F. boilers are equipped for burning surplus gas from the coke plant and blast furnaces, coke breeze or coal.

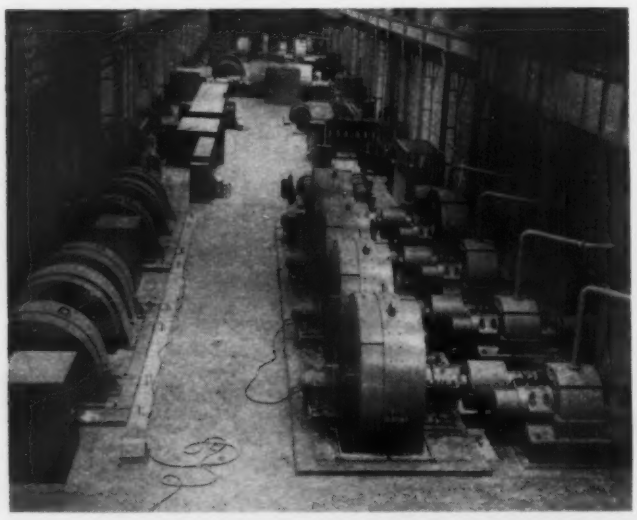
Power for Geneva plant is furnished by a 50,000-kw., 13,800-volt, 60-cycle General Electric turbine-generator located in the boiler room-power house. Here also are four steam turbine-driven Ingersoll-Rand turbine blowers which supply blast furnace air at a pressure of about 20-30 psi. A feature of the power house building is that boilers and turbines are located in one large room, without the usual separating wall. This design reduced construction costs and resulted in a very modern and efficient plant.

Geneva is the first complete steel mill unit where departure has been made from the old 6,600-6,900-volt steel mill "standard." This effected some very worthwhile economies in distributing something over 30,000 kw. to loads in an area 2½ miles long and a mile wide. All main drive motors at Geneva are of 13.8 kv. rating with the exception of the plate mill, transferred from Bethlehem Steel, which was already equipped with 6,600-volt motors.

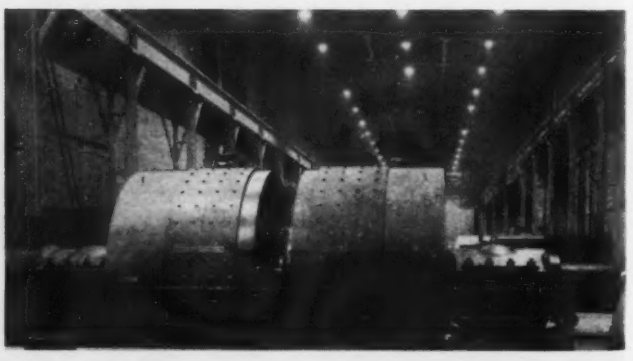
All distribution is underground, even to yard and street lighting. Thus, the many hazards of overhead distribution have been entirely eliminated and, moreover, appearance has been greatly improved. Distribution at 13.8 kv. is taken to unit substations at the coke plant, sinter plant, open-hearth area, shops, motor rooms, slab mill, plate mill and structural mill. The majority of the unit substations and other loads are fed by a loop system for greater reliability. Several of the substations are connected together on the 2,300-volt side of the transformers, further to add flexibility and reliability.

Power Interchange

Before discussing supervisory control and other features, mention will be made of the interchange arrange-



Main plate mill motor room (left) showing roll drives and large m-g sets. Below: Twin-armature 7,000-hp. d-c motor driving reversing roughing stand is world's largest motor in terms of torque. Two flywheel m-g sets that supply the d-c are controlled with amplidynes



ment between Geneva and the Utah Power & Light Co. A source of emergency power, as well as an outlet for excess generation, is provided by a tie with the Utah Power & Light Co. at a 138-kv. substation. Actual tie voltage is approximately 115 kv. but full equipment insulation at the higher level is provided for future operation. Substation capacity is 40,000 kva., consisting of three single-phase Allis-Chalmers transformers connected star and stepping down from 115 to 13.8 kv. Within the star is connected a three-phase regulator for tap changing under load.

The substation consists of an incoming line from the power company's Terminal substation at Salt Lake City, and an outgoing line to Helper, Utah, which feeds the coal mining area. Both lines are 138 kv. Switching is by means of three De-ion grid oil circuit breakers of 1,500,000-kva. interrupting capacity, supplied by Westinghouse Electric & Mfg. Co. To provide extremely fast operation, these breakers are operated by compressed air, thus overcoming the inherent saturating time of conventional electrical solenoid mechanisms.

All switching is done by supervisory control. Protective relaying is the carrier-current type and all necessary equipment is installed in the substation. A carrier-current communication circuit is taken to the main dispatching room in the plant switchhouse for convenience. The 13.8-kv. lines from the substation and the main generator are carried underground to the switchhouse. This windowless, air-conditioned building is adjacent to, but separate from, the power house. Here is installed all equipment necessary for dispatching, including supervisory control as well as the main plant bus with all appurtenances. From this building all power is fed out to the various points of usage around the plant.

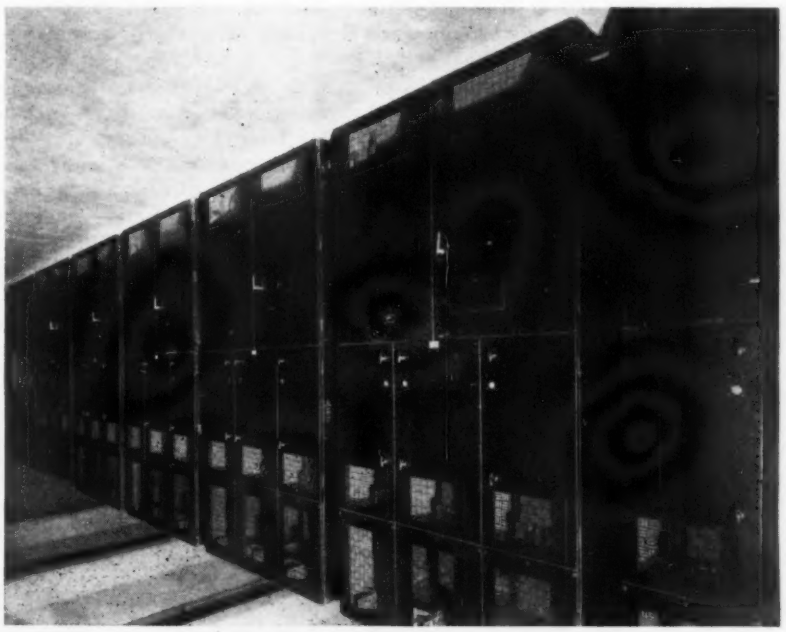
The main plant bus consists of sixteen Westinghouse compressed air circuit breakers rated individually from 1,200 amp. to 3,000 amp., 13,800 volts, 1,000,000-kva. interrupting capacity. This is the first major installation of this type breaker in an industrial plant, although various utility properties have used them for several years. Air is used to open and close the breakers as well as to help extinguish the arc.

Supervisory Control

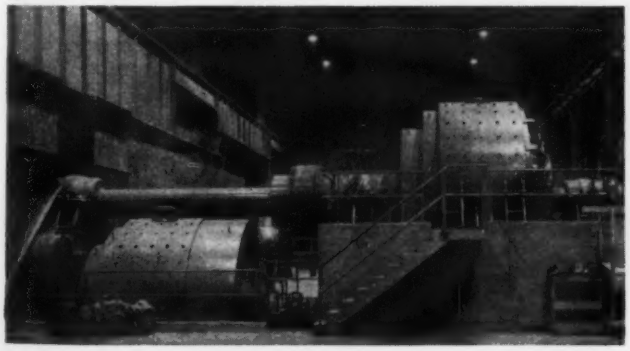
The dispatcher's board in the switchhouse contains an impressive array of instruments portraying at a glance the condition and activity of all utilities on the plant site, including electricity, gas, water, steam, etc. Adjacent to the dispatcher's room is the electrical operating room containing the world's largest concentration of supervisory controlled operations, consisting of over 500 points. Operations are divided into two boards. One contains all of the direct wire control for the main bus breakers and generator, as well as the supervisory control for the 138-kv. substation. At this board all synchronizing is done between the power company system and the plant.

The second board is the supervisory control board consisting of fourteen full-size duplex cubicles, furnished by Westinghouse Electric & Mfg. Co. The front panels contain indicating instruments, miniature bus and standard supervisory control escutcheon plates with indicating lamps. Control for each distribution substation, or motor room, is segregated onto one, or a group of panels so that identification is simplified. On the rear of these duplex cubicles are mounted the protective relays, including pilot wire relays, to protect the corresponding feeder from the main bus.

Supervisory control was selected for



Oil circuit breakers have given way to air-blast breakers (above). At lower left is twin-motor slabbing mill drive with two 5,000-hp. motors amplidyne controlled. Pulpit control (right) on reversing roughing mill operating automatic screw-down contains new features



this installation in order to concentrate all operating activities at one point, rather than have operators at each of the twelve operation locations scattered over the 1,600-acre plant. The resulting saving in labor was an important consideration, particularly under war conditions.

The supervisory control operates on the principle of sending and receiving coded impulses over a single pair of wires between each control point and the central dispatching board. Pieces of equipment to be controlled, or supervised, are assigned coded numbers. An escutcheon plate is provided for each of these points on the main control panel. When the operator turns the key on this plate, the supervisory control automatically sends out the proper coded impulse to operate the chosen equipment on the other end. Likewise, if a breaker in a substation trips from overload or fault, it automatically codes its number to the main board, lighting a lamp on the proper escutcheon plate, as well as sounding an alarm to notify the operator of an unauthorized operation.

In the substations, supervisory control is used to control the power until it is actually on the feeder going out to the point of use. It also indicates if the substation doors are opened by unauthorized persons. In the motor rooms, supervisory control is used for starting the large main drive motor-generator sets, roll drives, etc., so that they can be warm and ready to go when the mills begin production. Another advantage of supervisory control is that it prevents building up excessive peaks on the main generator when the mills are started up, since all operations are under control of one man. Provisions have been made against every conceivable chance of misoperation or loss of control. Each substation is provided with its own 48-volt supervisory control battery and charger, making the system entirely independent of a-c supply.

Substations

The substations at the coke plant, sintering plant, open-hearth furnaces and maintenance shop are each provided 13.8-kv. switchgear, step-down transformers, both 2,300 and 440-volt, with associated switchgear and a Westinghouse ignitron rectifier. Practically all direct-current on this project, including rolling mill auxiliaries, is obtained from nine rectifiers ranging in size from 750 kw. to 2,000 kw., and totaling 12,750 kw. Many of these in the rolling mill area are bussed together for obtaining ample capacity where needed. All circuit breakers in these substations are of the air type. This shows a definite trend away from oil in modern substation design, because of safety and lower maintenance.

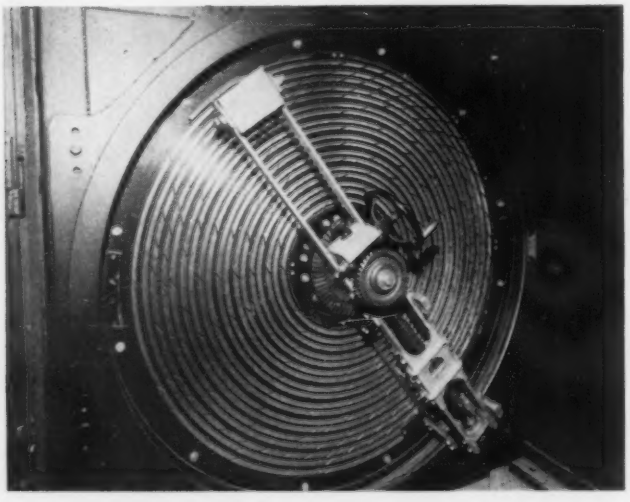
The three blast furnace skip hoist-houses are each provided with a three-unit Westinghouse motor-generator set, consisting of a 600-hp. synchronous motor with duplicate 250-kw. d-c generators on each end. A d-c bus connects all three houses, and one generator of each is tied to this bus for supplying constant potential d-c to the various motors around the blast furnaces. This bus can also be quickly connected to the ignitron rectifier in one of the substations in case of emergency. The other generator is used to supply variable voltage d-c to the skip hoist motors. In case of trouble with the motor driving an m-g set, a dummy shaft is provided so that the motor can be quickly removed, the two generators connected with this shaft and with one generator operating as a motor, the other generator will continue to produce variable voltage d-c for the skip hoist motors.

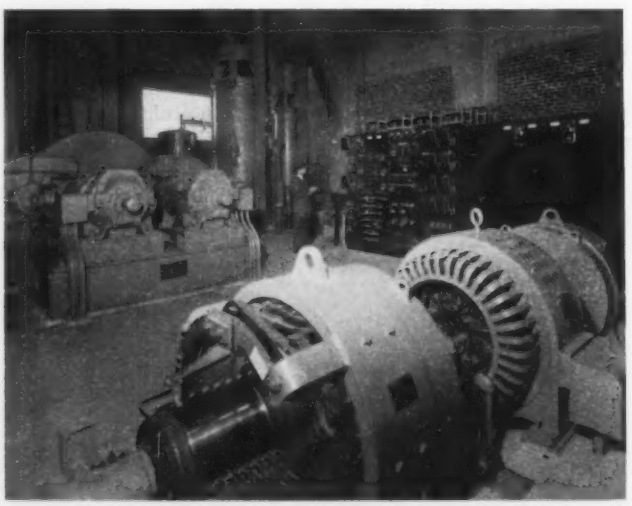
Rolling Mills

In the rolling mills all incoming power goes to the motor rooms where it is controlled and segregated into feeders and equipment drive circuits. Most outgoing feeders terminate in control houses built at locations convenient to equipment. These control houses are enclosed with brick and every effort was made to protect the multitude of contactors from mill dirt and dust. All incoming feeders and outgoing motor and control circuits are taken into a wiring trough built into the floor. The control boards are built as duplex panels spanning this wiring trough, which is provided with a metal removable cover. The front panels contain the contactors, relays, etc., while the rear structure forms a convenient location for resistor racks, and related equipment. This design greatly facilitates maintenance work on contactors and other equipment.

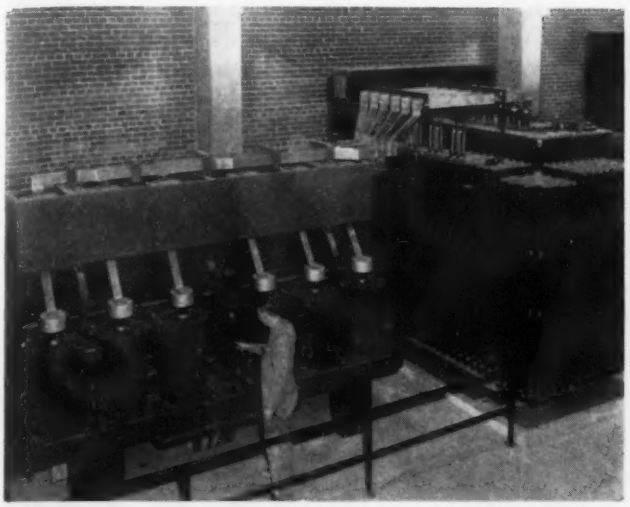
The first step in reducing an ingot (20 tons maximum) to a slab, and then to a plate, is by passing it back and forth through the slabbing mill until the desired thickness is obtained. This mill is driven by two 5,000-hp., 750-volt, d-c motors. These two motors are commonly referred to as the twin drive, which comes from the fact that both are identical in construction and characteristics. Each is directly connected to one of the mill rolls by shaft extension. The top motor is located above and behind the lower motor. Power is supplied by a 9,000-kw., flywheel motor-generator set consisting of four 2,250-kw. generators in par-

Limit switch used in connection with automatic screw-down on reversing rougher. Switch is kept in electrical step with synchro-ties on shafts of screw-down motors



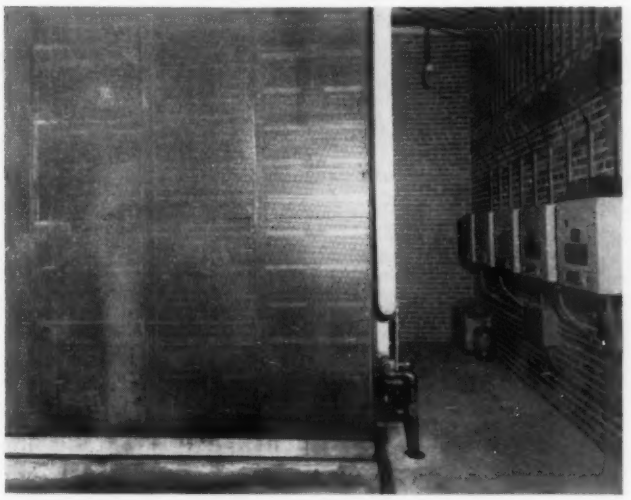


Dual d-c generators for blast furnace skip hoists. In case of motor failure, a dummy shaft connects the two generators, one acting as motor, the other generator



Ignitron rectifiers supply most all d-c at Geneva except for main mill drives. Installation shown is 1,500-kw. unit with associated transformer at sintering plant

Air is cleaned electrically for slab mill motor room by Precipitron electrostatic air cleaners. Clean air reduces maintenance. Unit shown handles 120,000 cfm



allel, driven by a 7,000-hp. slip-ring induction motor operating at 13,800 volts. The generators have amplidyne control, with which the twin motors actually reverse from base-to-base speed in less than 1½ sec.

When the ingot is reduced to the desired thickness of from 3 to 6 in., it is then run through the edger. This is driven by an 800-hp., 2,300-volt, slip-ring motor with reversing control. From the edger the slab is run on tables to the shear where it is cut into desired lengths for passing on to the reheating furnaces for the plate mill or to the slab yard for storage. All motors, m-g sets and amplidyne control in this mill were furnished by General Electric Co.

The steel ingot after leaving the slabbing mill has been reduced to a slab up to 60 in. wide, 6 in. thick and about 8 ft. long. The job of the plate mill is now to reduce the slab to plate, varying from 3/16 to 1½ in. in thickness and reaching widths of approximately 130 in. This reduction is accomplished by a series of roll stands, each having a separate driving motor located in the plate mill motor room. In this room, which is a totally enclosed building 65 ft. wide by 575 ft. long, is located the switchgear, control panels, cooling fans, etc., for the many large motors whose shafts extend through the walls, and with gears and pinions drive the mill rolls.

The first stand is known as the No. 1 scale breaker, and is driven by a 6,900-volt, 1,250-hp. induction motor through a reduction gear. The purpose of this stand is to break the outside scale of iron oxide on the slab so that it can be removed by high-pressure sprays of water.

After leaving the scale breaker, the slab is turned through 90° and then passed into the broadside mill, where it is widened from its initial width to a new width varying from 56 to 130 in. This mill is driven through a reduction gear by a 4,500-hp., 6,900-volt induction motor. After passing through these rolls the slab is again turned through 90° and passed on to the reversing roughing stand.

The reversing roughing stand consists of two horizontal rolls (supported by two back-up rolls) which reduce the thickness of the slab, and two vertical rolls which keep the width of the slab uniform. The horizontal rolls are driven directly by a twin-armature, 7,000-hp. d-c motor. This motor is the largest ever built in terms of torque, according to General Electric, the manufacturer. It weighs 490 tons and develops a maximum torque of 4,100,000 ft.-lb.

The vertical rolls, known as an edger, are driven through gears by a 650-hp., d-c motor. The d-c power for driving these two motors is supplied by a 7,000-hp., flywheel m-g set and a 500-kw. m-g set. These are held in synchronism and controlled with amplidynes. The slab is passed through this stand usually from three to five times and is reduced to an average of 1½ in. in thickness.

The original 8-ft. slab which has been elongated to about 30 ft., now passes on to the finishing stands which consist of five separate stands. The first, being the No. 2 scale breaker, is driven by a 500-hp., d-c motor. The four remaining stands are each driven through gears by 5,000-hp., d-c motors. These motors all receive their power from a 600-volt bus which is fed by two 7,000-kw. m-g sets, each consisting of two 3,500-kw. generators and a 9,800-hp., 6,900-volt synchronous motor.

Each stand reduces the slab somewhat until it leaves the last stand about 3/16 to 1½ in. thick and about 100 to 130 ft. long. The plate now passes on into the finishing department where it is sheared into lengths which can be more readily handled. All main drive motors, motor generator sets and amplidyne control above mentioned were furnished by General Electric Co.

Control of the 4,500-hp., 140-rpm., motor driving the broadside mill deserves mention. Control is all located in the pulpit out in the mill area, and is handled by the operator. The primary control consists of a 6,600-volt oil circuit breaker, interlocked with a dynamic braking oil circuit breaker in such a way that the dynamic breaker cannot be closed unless the primary breaker is open. Dynamic braking is accomplished by putting 30 kw. of d-c, furnished by a separate exciter for this purpose, onto one phase of the motor. With this braking the large motor can be brought to a complete stop from full speed in 60 seconds.

The secondary control is by means of a liquid slip-regulator, which essentially is a large water box in which secondary current is controlled by varying the spacing of the electrodes. Automatic operation of the motor, and control of the peaks are handled by this regulator, which in turn is controlled by a torque-motor receiving its power from amplidyne generators furnished for this purpose.

Pulpit Control

One of the outstanding installations in the 132-in. plate mill is the automatic screw-down, supplied by Westinghouse. While these devices have been used before, the refinements in

this most recent model make for faster, more accurate operation and greater schedule capacity. The screw-down is used to change the spacing between the work rolls of the reversing rougher corresponding to the desired reduction of the slab on each pass. If this operation is manual, the speed of rolling depends entirely upon the dexterity of the operator. Here again, is proven that machine can operate much faster and more accurately than man. It is only necessary for the operator to throw a single master switch successively for each pass. The screw-down then automatically reduces or increases the spacing between rolls according to the schedule previously set up on either of two plug-boards in the operator's pulpit. There is a maximum schedule capacity of eleven passes on each board. A separate schedule can be set up on each board, to be selected as needed by a selector switch on the main operating pulpit.

Air Cleaning

Precipitron electrostatic air cleaners (Westinghouse) play an important part in keeping equipment free from dust and dirt in the Geneva works. All three blast furnace skip hoist control houses, having many open control relays, are protected from dirt this way.

Installations also are made in the air intake of the sintering plant fan-rooms and in the incoming air ducts of the motor rooms in the structural mill and the slab mill. This latter installation, rated 120,000 cfm. of air, is the largest in the plant. Standard practice is to draw the air through the Precipitron cells by a fan which keeps the air pressure in the protected room slightly above normal outside pressure to prevent leakage of uncleaned air into the room.

By removing air-borne dust from cooling air with Precipitrons, maintenance will be greatly reduced and major equipment can be operated for much longer periods between shut-downs for cleaning—all contributing to higher sustained production schedules and lower costs.

Space will not permit discussion of many interesting electrical details throughout the plant, such as combination mercury and incandescent high-intensity lighting, the carefully worked out central maintenance program, details of electrical construction methods employed, etc. Suffice to say that Geneva represents the last word in steel mill electrical practice. Here is a steel mill built around the switchgear and the electrical design, instead of the usual reverse of this situation, with the result that a high performance record may be expected from its exemplary installation.

BMI Electrical Maintenance

Experienced, well-organized electrical maintenance force solves unusual problems of dust and acid deposits at Basic Magnesium plant

H. H. Gillings
Basic Magnesium, Inc.
Las Vegas, Nev.

ELECTRICAL maintenance in any industrial plant with load approaching 200,000 kw. is naturally a big problem, but at Basic Magnesium, Inc., Las Vegas, Nev., this phase of operation assumed unusual proportions because of a number of special problems arising out of the process used. Some of these were of a nature rarely met with in the average industrial plant and have taxed the experience and ingenuity of the electrical maintenance staff.

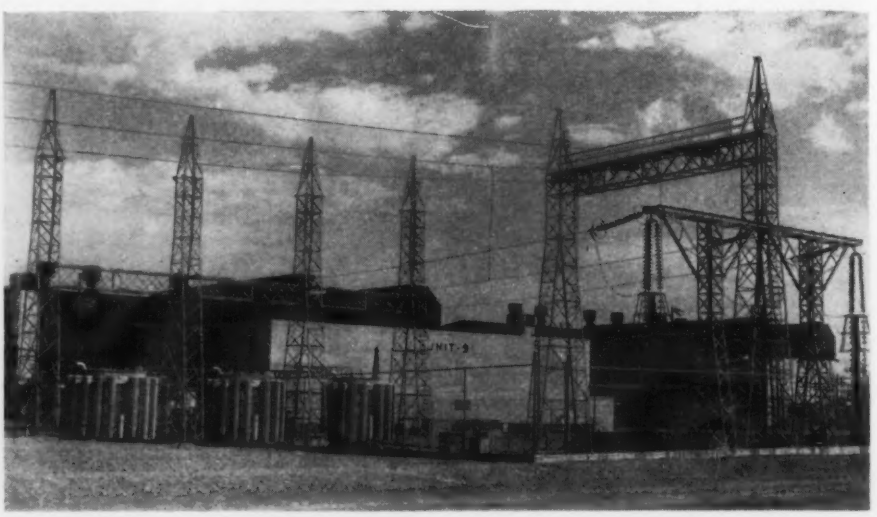
One problem is coping with a bluish-green corrosion on all exposed outdoor copper, switchblades, contacts and other metal parts as a result of small traces of chlorine gas combining with moisture in the air. As a result, all contacts, and working parts of switch mechanisms, relay parts and the like, must be frequently inspected and carefully maintained. This same acrid atmosphere and just plain dirt and dust raise havoc with contact shoes on cranes, commutators and other vital electrical parts. If corrosion of outdoor electrical equipment had been the only thing that developed, the problem would not have been nearly so bad. Just to make things more interesting, it developed immediately that 230-kv. insulators and bushings accumulated a coating of desert dust and moisture combined with gases from the plant that would cause flashover within a period of two weeks.

There are times, too, with conditions just right, when the cooling air for the many large m-g sets becomes vitiated with hydrochloric acid in the form of minute particles and would wreck a commutator in a few hours' time, if not checked.

Danger of flashovers was lessened by removal of 810 insulator units from 230-kv. structures. Remaining insulators and bushings must be washed monthly to remove acid deposits

Maintenance Organization

This recitation of just a few of the maintenance problems at BMI should convey some idea of the importance of the electrical maintenance department at an industrial plant of this kind. When the writer took over maintenance at the end of construction, the first important decision that had to be made was whether to consider maintenance from the standpoint of an industrial plant, or from the utility angle. Since the plant has three major 230-kv. substations, a maze of 13.8-kv. underground feeders, many large unit substations, a semi-supervisory control system, numerous switchboards and control centers, a complete relay protective system and other features common to utility systems, it was decided to set up electrical maintenance on the basis of men whose background was primarily



power company, rather than purely industrial. The wisdom of this decision has proved itself over and over.

Most Problems Solved

It would be quite impossible to enumerate at reasonable length all the headaches of the electrical maintenance department at BMI and the remedial measures worked out. Suffice to indicate the solution to the particularly vexing problems already mentioned. No solution has been found to the corrosion problem on outdoor equipment other than frequent inspection, cleaning and, in some cases, greasing of contacts and working parts. Contacts and small springs in relays and similar equipment must be inspected frequently or complete failure will occur.

Several flashovers on the 230-kv. system were experienced due to a combination of moisture and accumulated deposits on the insulators, bushings, or potheads. An analysis of the deposits shows that magnesium chloride is predominant. When moisture is added to these deposits the surfaces of the insulators and bushings become covered with a conducting medium resulting in a flashover and an interruption to service. Even though the insulators may not appear dirty by the usual standards, the addition of moisture will cause a flashover. As long as the deposit is dry, no particular trouble develops except that the deposit becomes hardened and is difficult to remove from the insulator surface. In fact, steel wool is frequently required to remove this deposit.

The original 230-kv. installation was adequate, although it has undergone considerable modification by BMI electrical forces because of this flashover problem. The changes carried out eliminated 810 insulator units and were all with the object of eliminating *suspension* insulators as well as reducing generally the number of insulator strings in the original design. Thus the flashover problem, due to plant gases characteristic of the process used, was mitigated to some extent simply by modifying structural design to eliminate every possible insulator string, particularly vertical strings, since their surfaces more readily pick up dust than do horizontal insulators.

Two tons of molten magnesium are poured from crucible into endless belt of moulds in casting of ingots at Basic Magnesium. Magnesium is principally used for incendiary bombs and aircraft

Considerable success has resulted in controlling this flashover problem by frequent high-pressure washing of all insulators and bushings that are subjected to the combination of these deposits and moisture. The period between insulator washings is somewhat variable and depends not only on the amount of the deposits, but the atmospheric conditions as well. On an average all 230-kv. insulators and bushings are washed once a month. In some cases, however, it has been necessary to increase the frequency to about every two weeks.

The pressure used on the washing system varies from 85 to 150 psi. A 1½-in. rubber-lined canvas hose is used with nozzle of ½ in. orifice. When washing the transmission towers and the higher structures in the racks, the hose is taken up on the tower so that the stream of water can be directed on the insulators at comparatively close range. The oil circuit

Metals building (left) containing five three-unit m-g sets that produce part of d-c for electrolytic cells. A 5,000-hp. motor drives two 1,750-kw. generators in each set. Half of d-c at BMI is produced by ignitron rectifiers (right). Each of the 12-tube Westinghouse units shown delivers 5,000 amp.

Six Westinghouse transformers supply the ignitron rectifiers in this metals building. Those at either end are for conversion to 250 volts d-c. Center transformers have automatic tap changing for regulating 13 8-kv. supply

breaker and transformer bushings and insulators at lower elevations are washed from the ground.

High-pressure pumps have been installed adjacent to the three main 230/13.8-kv. transformer banks to facilitate this washing program. On the 230-kv. transmission towers and the other locations remote from these permanently installed high-pressure pumps, a high-pressure pump and water tank truck is supplied by the plant fire department. The circuit on which washing is to be done is de-energized and cleared for work and any adjacent circuits where any possible hazard might exist, due to traces of moisture from the washing being carried by the wind, also are de-energized. In general, the washing of the insulators and bushings on a main transformer bank requires approximately two hours. In connection with the washing schedule, it is also necessary to wipe the insulators and use steel wool where required at about six-month intervals.

When the metal units started production, a great deal of electrical maintenance developed. Source of greatest trouble involved the cranes in the chlorination department. Magnesium chloride used in the preparation for charging the chlorinators settled on everything in the buildings in the form of a fine dust. This magnesium chloride dust is intensively hydroscopic and becomes wet at 35% humidity. The water and dust at this humidity changes to an electrolytic coating of hydrochloric acid. Allowed to dry again, the dust sets as hard as concrete.

This dust settled in large amounts on the cranes used in charging the chlorinators, due to the necessity of shaking the pellets loose from the charging crucible in which they frequently adhered quite firmly. The crane's collector arms and shoes are directly above this charging operation and, as large clouds of this dust would rise during the operation, a large amount would be deposited on the collector arms and shoes. Whenever the weather would become wet or humid, this magnesium chloride deposit would change to an electrolytic coating.

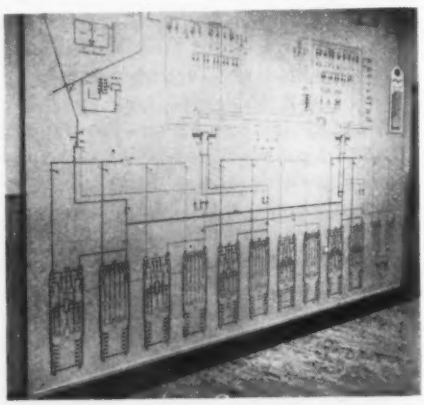
The shoes were clamped on the collector arms about 1½ in. apart, normally a sufficient spacing for 440-volt conductors and was quite satisfactory so long as the deposits remained dry. However, whenever dampness occurred the 440-volt conductors shorted and grounded out. This occurred so often that maintenance was rapidly becoming a major problem. The crews were puzzled and discouraged. A cleaning program was arranged wherein the collector arms and shoes were wiped at periodic intervals. This arrangement was satisfactory until the first wet day occurred, when the trouble developed again.

A washing program was next experimented with and proved to be successful insofar as cleaning was concerned. However, the collector arms had to be dried after each washing, resulting in the crane remaining out of service until the drying process was completed.

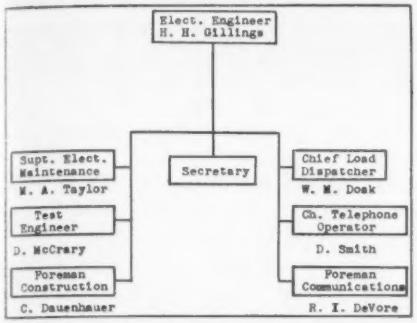
Originally linen tape covered with shellac was the insulating material used. Due to the prevailing conditions this deteriorated rapidly, requiring continued replacement. Glass tape applied over varnished cambric tape was substituted. This proved to be an improvement, but had to be replaced at about 90-day intervals and also required drying after a washing program.

One of the cranes was then stripped of its shoes and collector arms and a coating of pyroflex was applied to the entire collector arm, leaving only the connections bare. These were then reassembled and tried out. This plan proved satisfactory and has been applied to all 20 cranes used in this particular operation. The collector arms and shoes are now washed and full voltage applied to the crane trolley immediately without arcing or damage. This has resulted in a reduction in electrical maintenance of from 15 man-hours per crane per week to one man-hour per crane per week.

Damage to commutators on the many large three-unit m-g sets supplying d-c for the electrolytic cells developed into a major maintenance problem, also. Particles of copper from the commutators would become embedded in the carbon brushes and,



Load dispatcher's board (above). 600-volt air circuit breakers (below) of 50,000-kva. interrupting capacity are extensively used. Shown is a Westinghouse draw-out breaker of this type



Type of maintenance organization at Basic was an important consideration

in a matter of only a few hours, commutators would become rough and arc excessively. If not attended to promptly, a large commutator could have been ruined within a short time.

Many unsuccessful attempts were made at solving the problem until the primary cause had been discovered. The trouble was traced to the ventilating air, which was found to contain microscopic particles of hydrochloric acid. The acid was being formed by passage of small quantities of chlorine gas and magnesium chloride dust through the air-washer cooling system that had been installed for each of the large buildings.

Upon the air contamination discovery, attention was directed to freeing the ventilating air of the hydrochloric acid fumes. The obvious approach was to eliminate the water and moisture in the air coolers, and this has quite largely provided the answer. Fortunately, half the tremendous d-c requirements at Basic had been supplied by ignitron rectifiers which were immune to this particular problem, so perhaps the problem was only half as bad as it might have been.

These are some of the major maintenance problems that have developed, but innumerable smaller problems have arisen that would try the patience of Job. Dust on lighting fixtures and mercury lamp ballasts, not only has made maintenance a chimney sweep's job, but has caused contact trouble, excessive heating and other woes.

However, more than two years' operation at BMI has shown that, with a well trained maintenance organization and prompt and intelligent attention to each and every problem that arises, electrical equipment in an industrial plant of this size, even with its many unusual problems, can be made to render a high degree of continuity and reliability. All to the end that *magnesium* so vital in war production had been flowing in ever increasing quantities from DPC's Basic Magnesium, Inc. plant, up until the recent curtailment problem became effective.

13.2-Kv. Mine Distribution

High-voltage underground power distribution invades mining field. Metal-clad switchgear and unit substations eliminate old hazards

A. C. Stevenson
Bunker Hill & Sullivan M. & C. Co.
Kellogg, Idaho

J. F. Gogins
General Electric Co.
Spokane, Wash.

GROWING with the Bunker Hill mine since before the turn of the century, the present modern 13,200-volt mine power distribution system can claim to be one of the most outstanding mine distribution systems in the world. It is another tribute to progressive management and engineering of the Bunker Hill organization. This company's sink-and-float plant, iron recovery plant, automatic zine fuming plant, electrolytic antimony plant, and spectrophotometric laboratory are already well known in mining circles. Bunker Hill's principal business is lead, zinc and silver mining in the great 60-year old Bunker Hill mine. With the Bunker Hill smelter and the affiliated Sullivan Mining Co. they produce "Bunker Hill" brand lead and premium "Bunker Hill 99.99 Zinc."

One of the first to install 2,300-volt power cables for underground workings, the mining operations gradually outgrew that potential. By 1937, the electric power requirements underground had increased to the extent that a program of power improvements was demanded. Power interruptions were becoming too frequent; voltage regulation underground was poor; voltage drop from hoisting peaks often caused important pump motors to stop work; the old substation room was badly crowded, wet, and equipment was hazardous to personnel. Additional pumping facilities, more underground loaders and haulage equipment and increased hoisting capacity were required as lower levels were developed to meet demands.

The primary feeder system in the mine consisted of three 2,300-volt feeders (see accompanying drawing):

1. The Reed feeder composed of a power company-owned 13,200-volt transmission line from 110/13.2-kv. transformers in the Kellogg station to the Cherry raise where transformers connected to a 2,300-volt cable extended into the mine substation. The transmission line was badly exposed to lightning disturbances.

Cable splice with armor clamp on three-conductor 2/0, 13.2-kv. underground cable at Bunker Hill & Sullivan mine

2. Two 2,300-volt cables of different ratings in the Kellogg tunnel carried power from a 110/2.3-kv. transformer to the mine substation.

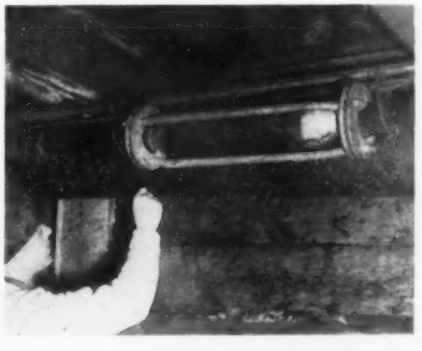
The Reed and Kellogg tunnel feeders were not designed for paralleling or dividing the load properly, consequently lost the advantages of diversity.

Because of the difficulty of calculating the results of the complex feeder system manually, and the many alternative solutions which deserved consideration, the entire problem, including known future load requirements, was laid out on the a-c network analyzer at Schenectady, by General Electric engineers. The analyzer indicated the economical distribution voltage, sizes of feeder cables, voltage regulation, and division of loads over the individual feeders. Also, interrupting requirements of all power breakers and direction of flow of fault currents were learned.

13.2-kv. System

The modernization had to be carried out gradually without interrupting mining operations. It had to keep pace with the new mine power requirements. First, a 13,200-volt cable was installed from the juncture with the transmission line at the Bluebird station to the Underground station. The power company installed step-up transformers for the Reed feeder to permit serving all feeders from the same source, and a bank of step-down transformers underground reduced the voltage to 2,300.

Then, all 2,300-volt feeders were paralleled. Next, the 2,300-volt underground switching equipment was modernized and installed in a dry location



and adequate interrupting capacity for short circuits and safety for personnel was provided. After installation of a 500-hp. pumping station on the 17 level, continuity of feeder service became even more important.

To avoid any interruption of electric service due to any single accident which might occur in a mine tunnel or shaft or to the Reed pole line it was considered advisable to install a second 13,200-volt feeder. The second feeder would follow an entirely different route, thereby providing two main arteries, either of which has sufficient capacity to carry the entire power supply required by the mine. This second 13,200-volt feeder, installed in the Kellogg tunnel, now made paralleling at 13,200 volts advisable in the Underground station. Meanwhile, the mining operations had pushed to lower levels and richer ore bodies. Additional pumping and other power loads became necessary. The experience of improved operating conditions at 13,200 volts justified the extension of a feeder from the main underground station to a second 13,200-volt substation on the 21 level to improve power conditions in the lower workings.

The pictorial diagram illustrates the present system. All power is purchased from the Washington Water Power Co. at 2,300 volts and stepped up to 13,200 volts. From an unattended surface substation equipped with modern metal-clad switchgear, two 13,200-volt feeders carry power to the Main (Bottinelli) substation some two miles underground. The Reed transmission line has been rebuilt circling Bunker Hill and traveling up the famous old Wardner Gulch to Bluebird station.

Here a tap serves the John George mill and Bluebird hoist. Then, the 13,200-volt three-phase feeder cable continues 4,100 ft. down the 45° incline Cherry Raise to the Mine substation on the Kellogg tunnel level. The cable is 3½ in. in diameter and weighs 15 lb. per foot. It is size 2/0, type H-VC LJWJ, having 21/64-in. varnished cambric insulation and copper shielding tape on individual conductors. An 8/64-in. lead sheath provides moisture protection and No. 4 BWG galvanized steel wire armor and a jute wrap overall give mechanical protection. Kellem cable grips suspend the cable from studding down the Cherry Raise.

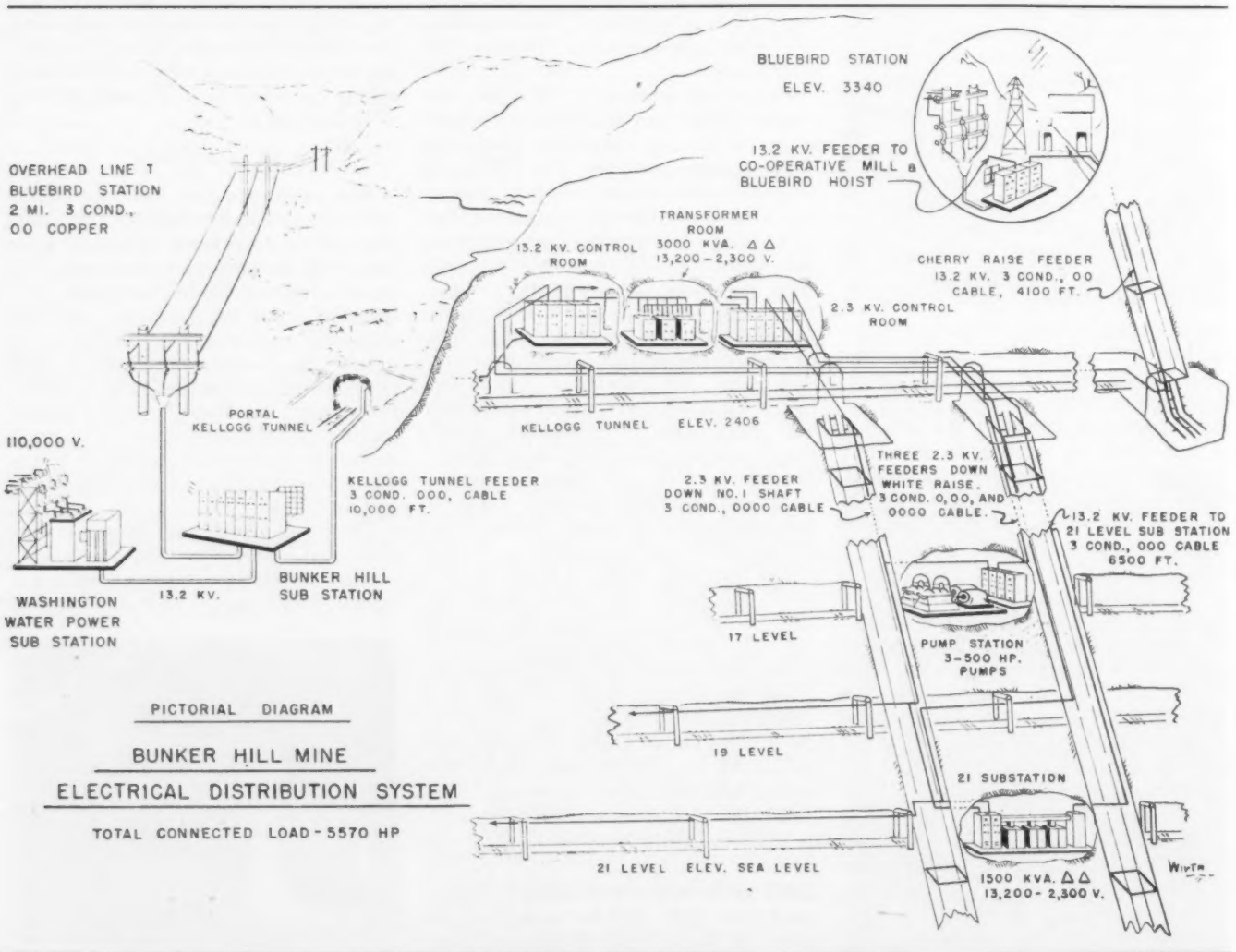
The second 13,200-volt feeder is cable all the way for 10,000 ft. horizontally through the Kellogg tunnel to the Mine substation. Of similar construction except having spirally wound steel tapes in place of wire armor, this cable is size 3/0 and is supported by messenger wire. One of the accompanying photographs shows a splice in a horizontal run of this cable.

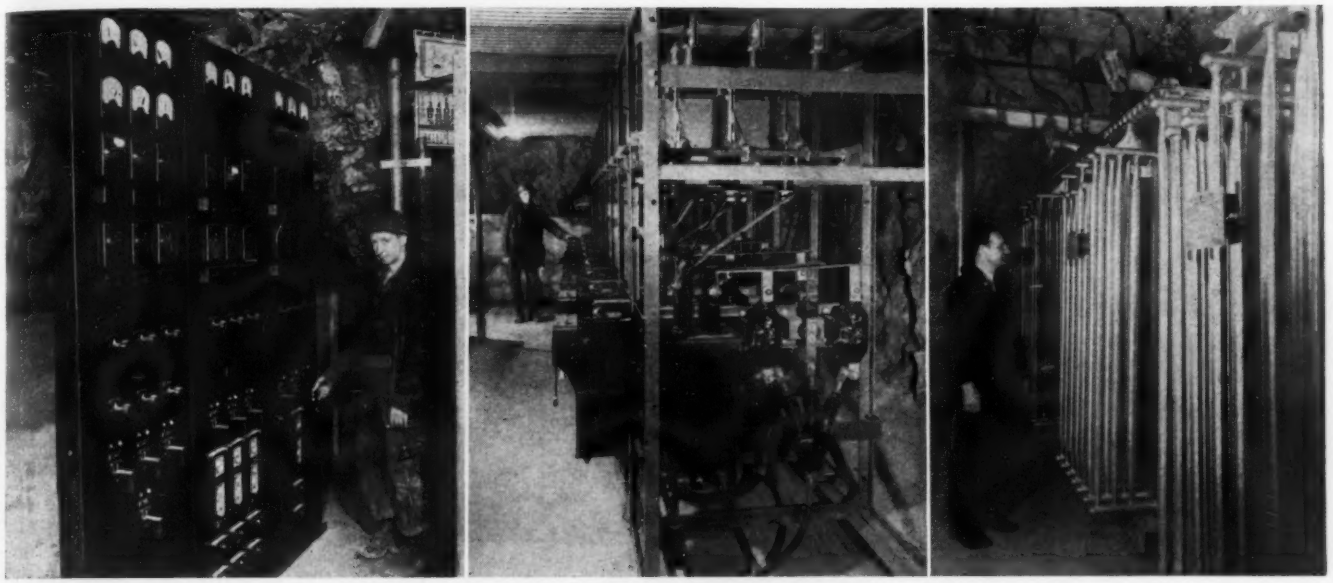
The two feeders are paralleled both in the Underground substation and on the surface. Selective relaying insures the interruption of only one feeder in event of fault. Both feeders are carefully protected against lightning and high voltage surges by protective capacitors and Thyrite lightning arresters installed both inside the mine and out.

The 13,200-volt metal-clad switchgear, illustrated, is located in the Mine substation to distribute power:

1. Over another 6,500 ft., 13,200-volt cable to a 1,500-kva. substation on the 21 level where power is served to various requirements on the lower levels at 2,300 volts.

2. A 13,200-volt synchronous motor driving the hoist m-g set for the new main hoist, a 1,200 hp. amplidyne Ward-Leonard controlled, Nordberg


BLUEBIRD STATION
ELEV. 3340
13.2 KV. FEEDER TO CO-OPERATIVE MILL & BLUEBIRD HOIST
OVERHEAD LINE T BLUEBIRD STATION 2 MI. 3 COND., OO COPPER
TRANSFORMER ROOM 3000 KVA. Δ Δ 13,200 – 2,300 V.
13.2 KV. CONTROL ROOM
CHERRY RAISE FEEDER 13.2 KV. 3 COND., OO CABLE, 4100 FT.
2.3 KV. CONTROL ROOM
PORTAL KELLOGG TUNNEL
KELLOGG TUNNEL ELEV. 2406
110,000 V.
KELLOGG TUNNEL FEEDER 3 COND. 000, CABLE 10,000 FT.
2.3 KV. FEEDER DOWN NO. 1 SHAFT 3 COND., 0000 CABLE
THREE 2.3 KV. FEEDERS DOWN WHITE RAISE. 3 COND. 0, 00, AND 000 CABLE.
13.2 KV. FEEDER TO 21 LEVEL SUB STATION 3 COND., 000 CABLE 6500 FT.
WASHINGTON WATER POWER SUB STATION
13.2 KV.
BUNKER HILL SUB STATION
17 LEVEL
PUMP STATION 3–500 HP. PUMPS
19 LEVEL
21 SUBSTATION
21 LEVEL ELEV. SEA LEVEL
1500 KVA. Δ Δ 13,200 – 2,300 V.
PICTORIAL DIAGRAM
BUNKER HILL MINE
ELECTRICAL DISTRIBUTION SYSTEM
TOTAL CONNECTED LOAD – 5570 HP



Left: Control board for 2,300-volt switchgear in main underground substation. Center: Open framework bus and switchgear of old type, same station. Right: Underground transformer station with Pyranol transformer bank

hoist, another first for Bunker Hill and an advanced step in mining equipment, and

3. A 3,000-kva. bank of Pyranol (non-inflammable liquid) insulated transformers, illustrated, providing 2,300-volt power for a substation distributing to various mine feeders in the upper level, including the main pumping station which is provided with three pumps driven by 500-hp. motors.

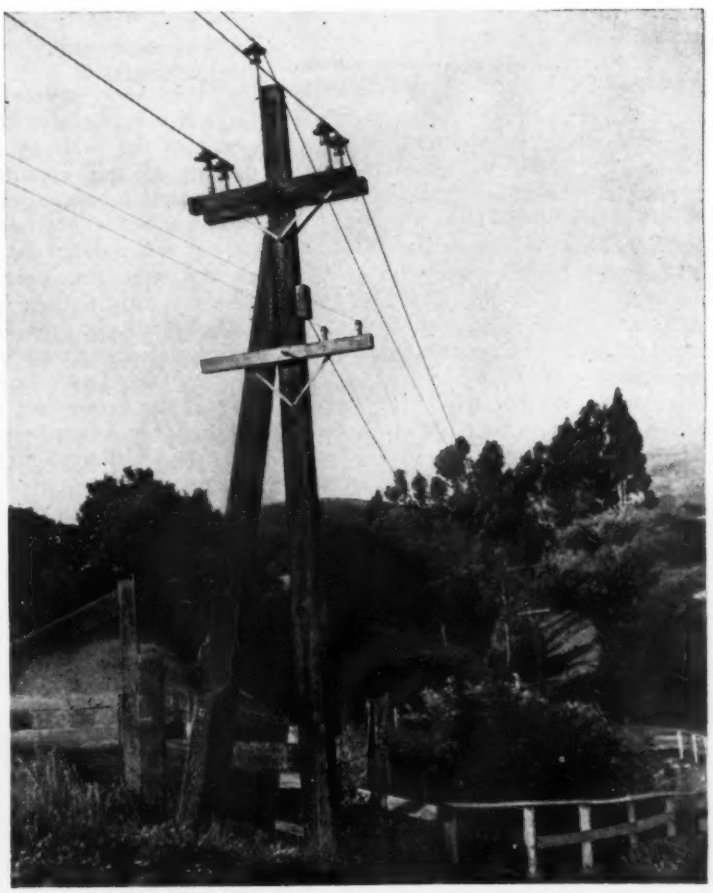
The capacity of this distribution system can be readily doubled by installing duplicate transformers in the main substations inside and outside the mine, the feeder cable capacity being ample. As the mine grows in area, additional 13,200-volt feeders can be installed underground. Through the use of 13,200 volts it is believed the present system will provide adequate capacity with good regulation and service continuity for Bunker Hill & Sullivan M. & C. Co., mining operations for many years in the future.

Historic California Pole Line

Around this old pole line might be written a lot of early California electrical history. It is one of the few remaining original poles in the 60,000-volt line built by the Standard Electric Co., in 1901, to transmit 10,000 kw. from Electra power house east of Stockton, a distance of 146 miles to the San Francisco Bay region. Woven with the history of this pioneer 60-kv. line is the colorful career of one Prince Andrea Poniatowski, a Polish development engineer who came to California to seek his fortune and found it, not in the power business, but by marrying the daughter of a wealthy flour mill pioneer.

The line was built with square sawed redwood poles, wood insulator pins, wood crossarm brace blocks and wood braces instead of guys. The theory of design was to keep metal in the assembly to a minimum, the idea being that metal would attract the electricity. Two-part Locke insulators were used on the long pins, the top piece being porcelain with a water shed feature and the petticoat section was glass. Conductor was 471,000 cir. mil., 37-strand all aluminum.

The pole illustrated is in Mission Pass near old Mission San Jose. Aside from half a dozen poles in Mission Pass and about as many near Redwood City, the line has been rebuilt for lower voltage. Soon, the few remaining poles will have been removed and with them will go the last vestage of this epochal transmission line that has left its imprint and romance in the early history of the pioneering West.



Aircraft Engineering Dominates AIEE

War effort is aided by large number of papers dealing with aircraft electrical design. President Powel discusses engineers' welfare

ELECTRICAL engineering problems in aircraft applications were the subject of most papers presented at the Los Angeles technical meeting, AIEE, held Aug. 29 to Sept. 1. This meeting, normally the Pacific Coast technical meeting, was this year held as a local meeting and so designated in an effort to discourage out-of-town attendance because of the transportation situation. Total registration reached the surprising figure of 533, of which 115 were from out-of-town. Primary purpose of the meeting was to permit presentation of papers and an interchange of ideas on electrical applications in military aircraft, and in this respect the gathering proved highly successful and of great value to the war effort. Of 67 papers presented, 53 were on this subject.

In addressing the opening session, Brig. Gen. O. F. Stace stressed the value of such meetings in affording an opportunity for more effective coordination of ideas and action between engineer, designer and manufacturer.

Institute President C. A. Powel likewise paid tribute to the electrical engineering profession for its contribution to war production. He emphasized the value of the Los Angeles meeting with its great preponderance of aircraft papers in finding solutions through technical papers and discussion to the many complex problems in electrical applications on airplanes.

A nation-wide association of engineers embracing all branches of that profession is favored by Powel as a medium through which engineers can act collectively in matters concerning their personal welfare. Two plans of joint action have already been tried, he reported. The first, put into effect by the American Society of Civil Engineers, authorizes sections of the ASCE to set themselves up as collective bargaining units. The second plan favors the inclusion of engineers in the general white collar unions.

Gaylord Powel

"I have been asked if the AIEE should not adopt some such scheme as the civil engineers. The answer is that the Institute has a committee jointly with the mechanical engineers to investigate the whole subject. I do not know what their report will bring forth, but I can say that their preliminary study brings out the tremendous difficulties of trying to make collective bargaining units out of our Institute sections.

"My present opinion," Powel said, "which may be changed later as the result of the findings and recommendations of this committee, is that I question if a bargaining agency in the ordinary sense of the term is necessary or desirable for engineers. It seems to me that the protection the engineer rightly seeks could possibly be more effectively provided by an overriding association embracing all engineers, devoted specifically to the welfare of the profession as a whole and the individual members comprising it. This association might be entirely independent of our technical societies which have a very definite, a very important and growing field of activity.

"What we need is some over-riding association of all engineers, either a new Engineering Council, or Society of Professional Engineers, whose purpose is to represent all branches of the profession in civic and state affairs, and also capable of watching over the welfare of its individual members. It must be understood that what I am proposing cannot be set up as a sideline of the Founder societies. It involves real money."

Electrical engineering problems in aircraft dealt with in the 53 papers devoted to this subject were nicely summed up by Lt. Col. T. B. Holliday, Wright Field, in a luncheon address before an audience of more than 400. Engineers who work with aviation are brought face to face with a whole series of new problems as a result of the ability of a plane to be anywhere in the world in two and a half days, he said. Designing equipment for an airplane is not like designing industrial equipment for the automobile or household. Operators of planes cannot afford to have a device quit in flight as results may be disastrous.

"A factor the electrical industry has not delivered too well is reliability," he declared. The life of only about 5,000 hr. that we get out of electrical accessories on a plane is the price we pay to get light weight and low volume. In some cases we have as low as 100 hr. trouble free life in planes. This is a shame! The problem of reliability and protection might well be approached from the viewpoint of the central station engineer who has four plants and must provide a protective system that will give unfailing service. He enumerated the serious problems confronting the electrical aircraft engineer as reliability, compactness, weight, extremely high and low tem-

Schwager Dalziel McConnell Tice Hinson Henline Blakeslee

Bettannier Brown Blakeslee Woodman Condon

peratures, cooling, dust, vibration, humidity, salt and radio noise."

The present meeting, he said, was the result of unprecedented teamwork in trying to make the electrical system on planes provide greater reliability and longer life. He suggested the fullest teamwork among engineers and manufacturers to develop the very best apparatus and build it to the highest possible standards. Col. Holliday hailed such a contribution of thought, research and exchange of ideas as presented at the Los Angeles meeting as a definite contribution to the war and the future of aviation.

Papers in the power group contained information of value to utility engineers in reporting results of tests, new designs, investigations and operating experience. In a paper on 230-kv. oil circuit breaker tests, A. C. Schwager, Pacific Electric Mfg. Co., showed that tank type breakers using the expulsion principle are practicable for 5- and possibly 3-cycle rating. Results he presented showed that with blade speeds of 18 to 28 ft. per sec., short circuit and charging currents on a 230-kv. system were interrupted in less than 1.5 cycles arcing time; successive interruptions during high-speed re-closing operations with only 13 cycles de-energized time are handled without difficulty; arcing times are small and there are no harmful over-voltages in interrupting charging currents; parallel resistors provide no improvement in performance, and the motor-wound, spring-actuated operating mechanism produces re-closing speeds not heretofore reached and permit full opening of the breaker during all re-closing operations. Tests were made on the Bonneville system using up to four 60,000-kva. generators.

Design features of new 138-kv. underground cable transmission lines in Los Angeles were presented by C. G. Mansfield, Dept. of Water & Power. Carrying capacity calculations were given and some noteworthy features of construction described. Divided manholes were used to increase radius of cable bends and conserve street space; circular duct configuration to reduce induced sheath and control cable voltages, and great stress was laid on all those factors that affect sheath life, since this is largely the determining factor in the service life of cables. The Los Angeles installation consists of about 12½ circuit-miles of 138-kv. cable that constitutes the first step in providing a loop system to include all major substations and a steam plant.

Three papers presented by engineers of the Bonneville Power Administration dealt with field determination of current transformer errors; a study of bussing arrangements at Grand Coulee, and influence on mutual coupling of transmission circuits on ground current distribution. These were authored respectively by E. S. Goodale and J. I. Holbeck, B. V. Hoard and G. W. Bills, and M. J. Lantz. A distance relay with adjustable phase-angle discrimination was described by S. L. Goldsborough, Westinghouse. Several who discussed this paper hailed it as a contribution looking to the solution of many unsolved relaying problems in long high-voltage transmission.

Three papers on electronics dealt with vacuum tube RF generators for induction heating; electronic frequency changers, and electronic high-voltage regulators. Physical and physiological aspect and effect of electric shock were discussed in two papers, one by Dr. M. S. Plesset of California Institute of Technology and the other by C. F. Dalziel of the University of California, a continuation of Dalziel's former work on this subject. Other papers dealt with a shipyard public address system, electric propulsion and arc furnace regulators.

Right hand column, reading from top to bottom, left to right: Morris, Northmore; Sadler, Allen; Smith, Gheen; Foulon, Veinott; Garrison, Gillings

Utility Construction for Army Posts

Designing wartime electrical distribution systems for flexibility and quick construction with a minimum of critical materials

*E. E. Tugby**
Senior Engineer
Ninth Service Command

THREE years ago this fall, the United States had the tiny nucleus of an army. The Axis armies were on the march. We were just beginning to realize that sooner or later the United States would be forced to fight for its national existence.

Time was *short* and many of us believed it was too short. With utmost speed we attempted to muster, clothe, equip, house, and train an army commensurate in size with the growing threat to our well-being across the seas.

Thus, the engineering profession turned its full attention upon the housing problem which confronted the War Department and embarked upon what has since become the greatest construction program ever attempted by man.

The experience of the Pacific Division of the Corps of Engineers, which has supervision of construction, and Headquarters Ninth Service Command, which has supervision of maintenance of military installations in eight Western states, is without doubt typical of the experience of the nation as a whole. I shall attempt to outline herein some of the problems involved in the design, construction, operation and maintenance of electric distribution systems for all of the many types of military facilities.

Certain elements were constantly in the foreground in the development and execution of plans. First, large numbers of troops needed to be housed quickly and in an orderly manner. This meant that utilities systems such as would be needed for towns ranging in population from 2,000 to 40,000 persons had to be installed before the troops arrived. Second, in a changing, dynamic, prewar situation, the electrical utilities had to be designed flexibly so that expansion could be made readily without extensive rebuilding. Third, design criteria which would utilize the minimum of critical materials in construction had to be established and constantly revised as suitable commercial substitutes for critical materials became available, and as the experience of troops occupying housing facilities dictated.

The general layout of the electrical distribution system at an Army post must be predicated upon conditions peculiar to the specific installation. The number of troops to be quartered and the type of training they will undergo provide the basic criteria which determine load factors and general design data. For example, utilization requirements at an air corps post where flying training is conducted vary greatly from requirements at an infantry training camp or a storage depot.

Since almost every Army post is within a short transmission distance from a large electric utility system, purchased power was used. Where transmission distances were uneconomical, generating equipment was installed with adequate capacity to permit shutdown for routine maintenance. In several cases the load grew so fast that the reserve capacity was used before spare generating equipment could be installed. Hence, it became necessary to increase capacity in a series of steps. Established tables of organization govern the size and character of each organization in the Army. Thus, when we learn that an armored division will occupy and train at a post, it is then possible to establish the basic design for the utilities. Each such division requires a certain number of theaters, churches, fire stations, laundries, hospitals, telephone exchanges, and post exchanges. In the case of stations where troops engage in flying, we know that hangars, aircraft repair shops, barracks and mess facilities will be required.

The interior electrical work of each building type had been laid out on standard drawings, and connected loads for each building established. The first problem, then, was to tabulate the various loads, apply diversity factors, and design a primary distribution system so that all feeders would be of adequate capacity to carry 150% of the designed load to allow for future expansions. At the same time, economy in the use of copper and critical materials had to be observed rigidly.

Presented before the Utah Chapter, IAEI at Salt Lake City.

For the distribution of electric power, the overhead system was chosen as a standard, because of its greater flexibility, economy of critical material, ability to withstand bombing with but minor damage, and greater speed of construction due to more readily available materials.

The salvage value of an overhead system is high and since the entire cantonment construction program was based upon a comparatively short life, this salvage value was of importance in that it presented greater possibilities for recovery of the investment at the end of the war.

An underground system involves larger amounts of critical material. Rubber for cable insulation and subway transformers was more difficult to obtain than standard distribution transformers. The necessary duct ways offered increased problems because the gas, water, and sewer lines usually occupied the space where the underground electric system duct lines normally would be located.

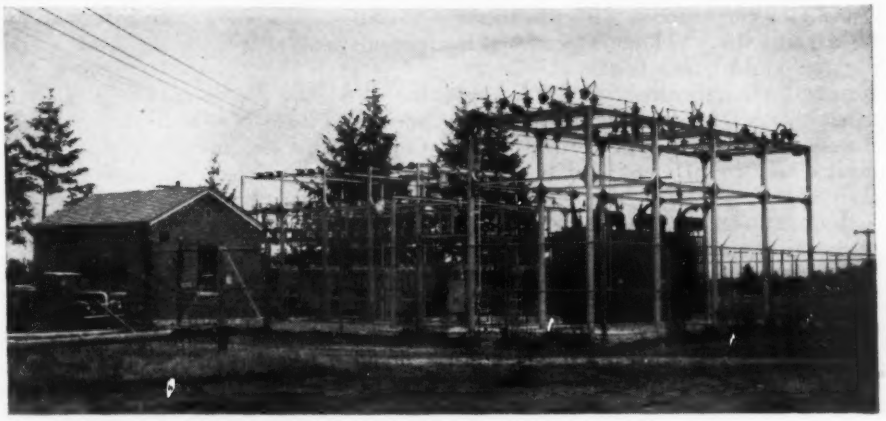
A simple overhead radial system was adopted as standard. Transmission distances were comparatively short, but, wherever feasible, tie lines were provided between radial feeders, if full use would be made of the tie line under normal conditions. Air disconnecting switches normally open were installed for tying two circuits together under emergency conditions to provide the alternate feed.

In the early days of the war, the usual distribution primary voltage was 2,300 volts delta, but with the acute shortage of copper which developed, the distribution voltage was raised first to 4,160 star then, whenever possible, to 6,900 delta or 12,400 star. In some instances here in the West, voltage was raised to 13.8 kv. delta.

This enabled comparatively heavy loads to be handled for the short distances involved on primary wire as small as No. 6 copper without exceeding the specified maximum drop of 10 volts secondary drop from substation to load.

The use of higher voltages also served the purpose of placing most post distribution systems at the same voltage as the serving utility distribu-

Substation at Fort Lewis, typical of those built before shortages developed



tion line, thereby eliminating a large bank of step-down transformers.

The general plan was to have the utility build and own the line as far as the distribution substation where the total load was metered. The government built and owned the substation with its associated switchgear. Each substation was of the simplest design. All non-essentials were eliminated. A wood structure was used in a number of the earliest installations for the high-voltage lines. Metal-clad switchgear was used for distribution line protection. However, when the use of steel was curtailed, the installation of metal-clad switchgear was prohibited. Thereafter, only the simplest wood structure with outdoor type protective equipment was used.

All pole heights were predicated upon joint use with communication facilities and to meet the required road clearances. Pole classes were chosen to conform to the loading district in which the station was built.

Since three-phase loads were scattered throughout the cantonment, and it was desirable to obtain the economy of three-phase distribution for single-phase lighting, all lines were three phase, with the single-phase transformers balanced across phases, unless feeding a small lighting load where the third wire and additional transformers would have used more critical materials than would have been required for carrying the entire load single phase.

In general, loads were grouped and fed from single-phase transformers balanced across the three-phases, with a minimum amount of secondary run. This permitted a very reasonable diversity factor, and loaded each transformer to a very economical point.

Demands range from 75 to 120 watts per man. Load factors range from 45 to 70%. The principal load is lighting, which usually requires 1 watt per square foot of floor space. That compares with 20 to 35 watts per man and a load factor of 30 to 50% which was experienced in 1918.

Primary construction was of the standard crossarm type and did not differ in any essentials from established practices. The Engineering Manual of the Chief of Engineers requires that the same standards be adopted as are in use by the serving utility. This enables the designing engineer to take advantage of the many years of development and research of the serving utility, and thus be assured of obtaining the best that can be obtained to meet the peculiar local conditions applying at the post.

Secondary construction usually was of rack type, which lends itself very readily to a multiple service take-off at one pole to feed a group of loads. Later, to reduce use of critical materials, the crossarm mounted secondary with wood braces in place of the customary steel braces was used. Racks with hardwood backs were tried in an effort to eliminate steel and still retain the flexibility of rack construction.

A street lighting system similar to that in any large city usually is provided. The 6.6-amp. series circuit type is the most favored. Standard fixtures were used because they were most readily obtainable and were familiar equipment to the construction linemen. This meant a considerable saving in installation time. Astronomical time clocks were provided for street light control, unless manual control was arranged from the guard house. The problem of the blackout zones led to considerable investigation toward finding a reflector that would be economical in first cost and at the same time provide the requisite degree of "cut-off" in order that there may be no light projected above 15° below the horizontal. Many homemade adaptations were tried and used successfully.

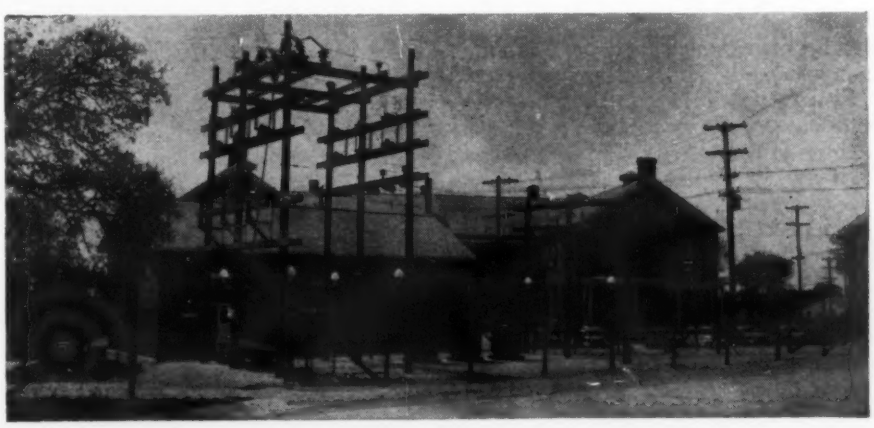
The interior wiring of buildings of all types was originally designed for the use of wire in conduit, wall switches, and adequate copper capacity for considerable increase in load after occupancy.

Thus the general picture of the construction of the electrical system closely followed the practices of any electric utility and interior electrical contractor, until the shortage of copper and insulating material became acute.

This shortage of copper forced the design engineer to give most careful consideration to copper capacities, and to study the economies of larger transformers and long secondary lines with good diversity, against smaller transformers, shorter secondary runs and poorer diversity. As it was impossible to lay down a hard and fast rule, due to the many and various types of buildings being grouped together at one point, each installation had to be considered on its own merits to find the solution most economical in the use of critical materials.

The requirements of the average military installation were a direct reversal of previous practices to many of the engineers who worked on these designs. In designing the distribution system for a private utility, it is necessary to provide a high degree of voltage regulation, allow for future additions to load, and to construct for a long-term investment with a minimum of service and maintenance.

Army Signal Corps Photo



After 1941, wood structure was utilized in constructing Army substations

Military construction design is based on a short life. Voltage variations, if not too violent, are tolerated. Transformers, theoretically, are loaded to capacity. Minimum size services are installed. Military regulations prohibited the use of electricity for other than specified purposes and in specified quantities. In reliance upon the assumption that the load in barracks and associated buildings would not increase, the original design was reduced to the bare minimum. In actual practice, loads such as radios, larger lights and electric razors increased the demand to an extent that overloading did occur in some cases until corrective measures were applied. In the standards of allowances, a given quantity of kilowatt-hours was specified per square foot of floor space per annum, which, if exceeded, required investigation. This tended to maintain some control on the amount of electric load carried, but, in many cases, as fast as oversize lights were removed by post authorities, new lights were purchased by the occupants and reinstalled. With the advent of the shortage of critical materials, the design of the interior installations was reviewed and every conceivable economy made.

Rigid conduit was prohibited along with rubber covered wire. Wall switches were eliminated wherever possible. Wire sizes were reduced to the minimum and every economy of circuit distance was practiced.

While synthetic insulation and thin wall conduit were available they were used, and upon their becoming scarce, a return was made to open wiring with nonmetallic sheathed cable and standard conduit being allowed only in locations requiring protection either from damp or mechanical damage.

Every effort was made to eliminate electrically driven equipment, wherever a substitute could be made using some other motive power or energy source. Electric cooking was prohibited except in hospital diet kitchens.

The reduction in loads was reflected in the design of the overhead distribution system by reduction of wire sizes, reduced transformer capacities, and smaller substation transformer banks, all of which totaled to a great saving in copper and other strategic materials.

Every possible substitution was made in line construction materials. Wood crossarm braces replaced steel braces. Wood pins were used. Guy wires were served and guy clamps eliminated. Log or concrete anchors replaced steel anchors. Iron wire replaced copper. Wood pole steps replaced galvanized steel steps. Also the reductions in loading changed the basic design factors and, from time-to-time, the "watts per man" factor, used as a yardstick to estimate total load, was reduced as more information became available from the field.

As each station was completed by the district and area engineers, a post engineer was assigned by the Service Command engineer. This post engineer is charged with a wide range of duties. He has under his authority all the normal duties of a city manager, except policy powers, and as such has to maintain and operate the water system, steam heat, sewers, electrical system, roads, streets and all buildings.

At most stations, all the various crafts are set up in departments each under a foreman or superintendent. At some of the largest stations, the electrical work may be under the supervision of an electrical engineer who has a superintendent for the outside work and one for the inside work, each with his own crews.

Thus when the original installation work was completed, it was not uncommon to find that a number of the men who actually built the electrical system stayed on as maintenance men and proved very valuable for the routine expansion that followed.

Even the best intentioned contractor was not too careful in selecting fuse link sizes, in setting oil circuit breakers, and in checking on grounds. In many cases it was necessary to make a physical check of all transformer fuses, and install the proper sizes, reset oil circuit breakers so that they would trip on a reasonable fault and recheck all grounding for correct resistance. The majority of the work of the line crews consisted of the familiar "one pole, one span" extensions so common in the electric utility business, and the running of additional services to connect up new installations. The need for a heavy line crew was not obvious as all work of magnitude requiring heavy crews was done on a contract basis. Therefore, no heavy equipment was considered necessary. The necessity of maintaining service requires some hot-line work, but this is not encouraged, because the average crew at a military post is not large enough to handle it properly.

Frequently, one of the larger posts will be charged with the maintenance of a number of smaller posts in the vicinity, a practice which keeps an average size crew fully occupied, and makes the most economical use of men, transportation, equipment and tools.

The customary standards of safety and first aid work, such as have been long recognized by electric utilities, are observed and every effort is made to maintain a low accident record.

Hot-line work is not encouraged but, at the majority of stations, qualified hot-line men are maintained and equipped with adequate hot-line tools for use when it is not possible to de-energize the lines when necessary maintenance work is to be performed.

Maintaining line crews at a number of the isolated posts has presented a problem, but the attraction of annual pay with vacation has helped in many cases. The fact that a number of the original contractors construction crews have remained on the post has materially assisted post engineers in maintenance of the electrical system.

Assistance is given linemen in preparing for better ratings, by means of instruction in line work and safety methods. The Repairs and Utilities Manual, which is available to the men at every post, contains a very practical chapter on accepted maintenance and operating practices. Another chapter covers a general outline of elementary electrical theory as applied to the majority of the equipment used.

Manufacturers' literature is also made available to the men, in order that they may become familiar with the products of each company.

The serving utilities have cooperated to the fullest extent and have established, in conjunction with the Army and Navy, a Utilities Wartime Aid Program. This program embraces privately operated electric utilities and federal or municipally operated plants. The plan is based on mutual cooperation between Army posts and utilities for aid in case of emergency such as may be created by storm, enemy action or sabotage in order to minimize the delay in restoring service to certain vital military areas.

Stocks of materials that may be needed for emergency repairs are listed by both Army and utilities and lists are exchanged. Thus, both organizations may maintain stocks of supplies at a minimum level with the knowledge that emergency supplies may be had upon call in the immediate vicinity. Assistance is also rendered by the utilities companies in training aids, the loan of special equipment that is not available to post engineers, and technical advice on the normal operation of the distribution system. Throughout the entire program of construction, the electric utilities companies have been most cooperative. In many cases they built the required distribution lines ahead of schedule so that electric power would be available to expedite construction of the military installation.

● Lighting Broadsides, in a series of three, covering manpower, production and maintenance, recently were issued by the direct mail promotional committee of the industrial and commercial lighting equipment section of National Electrical Manufacturers Assn., New York.

The Need

Adequate illumination to provide easy seeing in all bank areas for the staff, and cheerful, attractive and yet dignified surroundings for the customers.

Conditions

Main banking area is 36 x 23 ft., with 15-ft. ceilings. The office personnel space at the rear is 15 x 24 ft. with 10½-ft. ceiling. Entrance lobby is approximately 210 sq. ft., in L shape. Acoustical ceiling material covers the ceilings, painted in light tones, with light walls. Personnel space is under a dropped ceiling at the rear. Large windows, with venetian blinds, give ample daylight illumination during good weather.

LIGHT FOR A SMALL BANK

fluorescent

Who

National State Bank of Boulder, Colo. Huntington, Jones & Hunter, of Boulder, were the architects. Lighting design by Harold Rankin, Public Service Co. of Colorado; salesman was E. P. Fillmore. Fixtures made by Schockett Electric Co., Denver.

Installed

Main banking area was lighted by 12 recessed fluorescent fixtures, each employing six 40-watt F lamps above deep louvers.

Office personnel space was lighted by means of six recessed fluorescent fixtures of the same type, each having six 20-watt F lamps above deep louvers.

Entrance lobby was lighted by 12 recessed cylindrical units utilizing golden buff colouvered lenses, behind which is placed one 100-watt lamp in each fixture.

Results

Average illumination was 35 ft.-candles at the time of installation.

Survey Gauges Merchandising Opinion

Answers to questionnaire and dealer discussion plan aid Los Angeles Department of Water & Power in formulating postwar policies

POSTWAR merchandising activities of the Los Angeles Department of Water & Power will be based on a cross section of dealer opinion, secured from individual surveys made by utility representatives. The department did not sell appliances previous to the war and, according to R. H. Cockfield, residential section manager, does not intend to enter the merchandising field postwar, its policy being that of cooperative assistance to local outlets.

Philosophy back of the dealer inventory plan as explained by Cockfield was that, if opinions and suggestions of individual retailers on past and future promotional activities could be secured, a recapitulation would indicate group opinions, upon which a sound program could be formed.

In approaching the problem, a questionnaire, composed of 25 questions was so formulated that it would be applicable to dealers, plumbers, department and chain stores. Many of the questions were of equal interest to distributors, whose opinions also are desired by the department.

Questions covered eight subjects: appliance financing, retailers' requirements for salesmen and their training; store facilities and displays; merchandise; merchandise deliveries; installations and servicing; the utility's floor displays and prospect distribution; utility's wiring participation plan, major appliance specifications and servicing policy.

According to Cockfield, it was found that, where questions were answered during a personal interview, better results were obtained than where the questionnaire was left with the merchandiser to be filled out later and returned by mail. The personal interview and resulting discussion had the added advantage of furthering good relations between retailers and utility and of stimulating the retailer to start his own postwar planning.

Therefore, in the department's setup, the firm owner or distributor or factory representative was interviewed by a utility representative, who discussed the questions and recorded the answers. Representatives of the dealer relations unit called on dealers, the plumbers relations unit on plumbers, and calls on the distributors and manufacturers' representatives were made by the manager of residential sales. Completed questionnaires are confidential. Suggestions of particular merit were especially noted and coded as to source.

While revised programs and policies are still tentative, the survey findings are being reviewed with the groups concerned and further suggestions are being developed. Two such group discussion meetings had been made at the time Cockfield was interviewed, one with distributors and the other with merchandise managers of downtown department stores, and both had indicated confidence in this method of collective planning.

L. A. Pringle (left), department representative, interviews J. G. Conner of Conner's Electric on merchandising

The following is a recapitulation of the 110 surveys completed through August:

Appliance Financing—Merchandisers are generally in favor of an appliance finance plan whereby payments could be made with the utility's water and electric bills. Higher down payments, ranging from 15 to 25%, and shorter time contracts, 24 to 36 months, subject to the provisions of Regulation "W," are favored. A nonrecourse feature is desired, with a probationary period of approximately three months.

Retailers' Requirements for Salesmen and Their Training—The majority do not have any salesmen spotted. The average need is three salesmen per store, which amounts to a total of 600 salesmen for the City of Los Angeles. Nearly all are in favor of a dealer-salesmen's training school, but 50% think one conducted by the utility would be more effective, while the other 50% prefer a program by the manufacturers and distributors, with utility cooperation and support. They are unanimous in their desire for a refresher course on "How to Operate an Electric Appliance Merchandising Business."

Store Facilities and Displays—They are almost unanimous in their decisions to modernize and expand store facilities, and in desiring all-electric demonstration kitchens in their stores, these to be furnished on a cooperative basis by the utility and distributor. The majority are not planning on new or branch store locations.

Merchandise—Almost all retail outlets, including plumbers, indicate they will carry a complete line of electrical appliances. Twenty-five per cent of those interviewed will merchandise household appliances exclusively, and 25% will merchandise other articles such as furniture, hardware, and records. Approximately 50% are plumbers and will, of course, merchandise plumbing and heating equipment. A small percentage indicated they would sell electric equipment exclusively, and only a few indicated they would specialize in a particular appliance.

Merchandise Installations, Deliveries and Servicing—The majority indicated that they will make their own deliveries and installations, but would work through plumbing and electrical contractors for the respective appliance connections. They all plan to have a qualified service department.

Utility's Floor Displays and Prospect Distribution—There was an almost unanimous request for the return of the rotation plan of appliance display, whereby the competitive makes of appliances were rotated by the utility on its main and branch office display floors according to the makes handled by the retail outlets in proximity to the utility's offices. Fifty per cent, representing the dealer groups, indicate they desire retail salesmen to man utility display floors under the supervision of a department representative, and 50% desire the department salesmen to man the floors and equally distribute the prospects developed to the retail outlets in the area.

Utility's Sales Helps—Suggestions were many and varied. The majority suggested the following sales helps: a cooperative advertising program; direct mail advertising, such as bill stuffers, etc.; market surveys; a listing of

homes wired for but with no major electric appliances installed; cooking schools; store demonstrations; public school cooking classes; assistance with window displays in dealer's stores; appliance shows; adequate wiring promotion and business counseling.

Opinion is that the kitchen planning service is a good sales help, but that it requires more extensive publicity. It was suggested that dealers' salesmen be trained to gather all data from which department engineers could make the kitchen layouts for presentation by the dealers' salesmen.

The majority agreed that the home economist furnishes the greatest assistance by making individual demonstrations to consumers approximately ten days after the equipment is installed. They also desire continuation of cooking schools held at department demonstration centers and demonstrations in their stores for prospect groups.

In the matter of general policies it is considered essential that cooperation be maintained in the postwar period between the utility's sales department heads and the dealers. Closer dealer tie-in advertising is also desired.

Utility's Wiring Participation Plan, Major Appliance Specifications and Service Policy—They are unanimous in their opinion that a return of the department's free wiring policy would be the greatest possible help to sales. However, their opinions are about equally divided on the wiring participation plans, half preferring the department cash reimbursement, with a limitation on the number of reimbursements issued to an individual, and half preferring the plan which included a free service entrance unit on every installation, plus cash on the original appliance installation. The present major appliance service policy, which includes free labor, transportation, and parts at retail price, is satisfactory to the majority.

Most of the dealers who have cooperated with department programs in the past desire a closer coordination of the utility's sales and service organizations. The department's range and water heater specifications, which set a standard for certain basic constructions, are considered satisfactory and it is desirable that these standards be retained.

● ANNOUNCEMENT has been made that Patent No. 2203482 has been issued to Focsaneanu Alexander which covers broadly the basic circuit used in the installation of fluorescent lamps in fixtures. The patent has been under dispute in the patent office for nine years. Negotiations are said to be currently conducted with various companies leading to issuance of licenses.

To Test Electric Furnace

Use of electricity to provide furnace heat for homes will be given a thorough test in Spokane this winter in the home of L. L. Wartes, former employee of Seattle City Light.

Wartes, in telling of the plan, said that twenty years ago he designed a furnace to utilize offpeak power at the request of the late J. D. Ross, superintendent of Seattle City Light at that time. Seattle, however, did not have enough surplus electric power to allow thorough tests of the device, but should it prove successful, Wartes estimates that Spokane power surplus would permit installation of such a furnace in 1,500 homes.

The home in Spokane where the furnace is installed now is an all-brick residence of E. E. Darnell, who is a partner of Wartes in the Heatervoir Co. Darnell also has recently moved to Spokane from Seattle.

The Washington Water Power Co. is cooperating in the experiment and is loaning the services of Carl L. Hoffman, commercial sales supervisor, and H. C. Bender, research engineer.

The experimental furnace, which is 7 feet in diameter and 5½ feet high, will cost about $3,000 to construct and install, but it is thought that on a commercial scale the cost would be cut to under $1,000, and the electric bill is expected to be about the same as the outlay for an oil-burning furnace's requirements.

The principle of operation calls for the use of surplus electricity from 11 p.m. to 3 a.m. to heat a sealed water tank containing 700 gallons of water under 100-pound pressure. This hot water, when the vent is opened, is expected to provide enough heat to keep the house at a controlled temperature all day and evening.

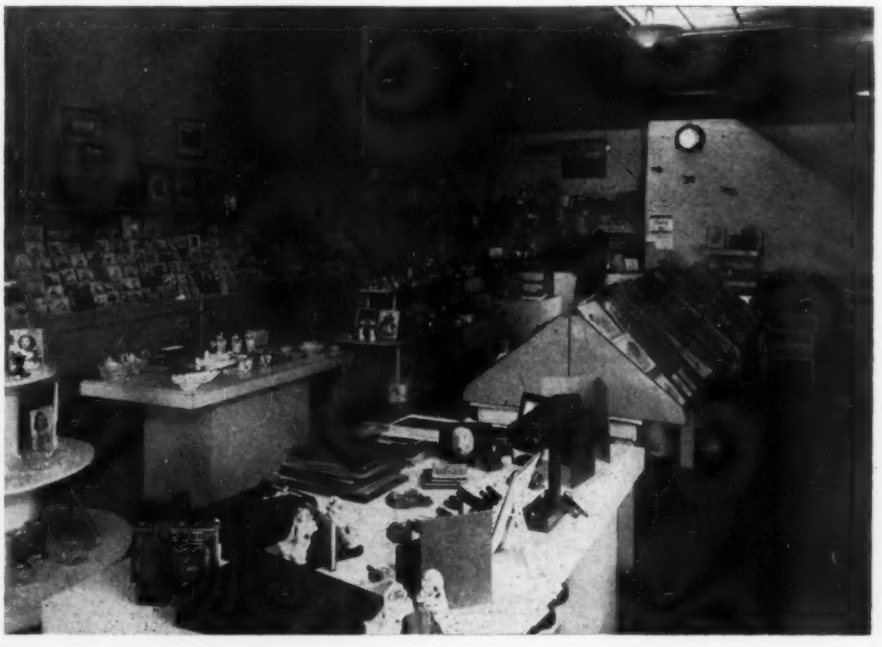
An outer steel tank, insulated with rockwool and fireproof cotton, will hold an inner tank which is shaped like a tube. This inner tank is 69 inches in diameter and 42 inches high. The air will be circulated through the center of the tank.

In the base of the furnace are two germicidal lamps, which the inventor believes will kill all the germs usually found in circulating air, and there are also aluminum and spun glass filters which will eliminate much dirt.

Careful records will be kept all winter on the temperature inside and outside of the house, the humidity, wind velocity, electric consumption and all other pertinent information.

● CHANGE IN POLICY regarding the rendering of complete electrical engineering services to architects and others through its commercial industrial sales group was announced by W. A. Huckins, sales manager, Utah Power & Light Co. Up to 1942 a complete service of this type was offered. Since that time very little has been rendered due to curtailment of private building. The commercial and industrial salesmen of the company will continue to contact architects and others and give information. However, the preparing of plans and writing of complete electrical specifications is not to be done in the future. The only exception will be in the making of lighting layouts and kitchen plans for homes in connection with the adequate wiring program.

Duration stock of Conner Electric Co., Los Angeles, includes many gift items



Consumer Wants Surveyed

Manufacturer makes test check to determine approach to problem of postwar conversion

REASONING that a manufacturer should approach the problem of selection of products, not on a basis of what devices he can most easily convert to making, but rather that he should go to the end of the line and consider what the consumer wants most, Ray Ellinwood, president of Adel Precision Products Corp., of Burbank, decided that a test check of consumers would be worth while. While it may be relatively easy to sell almost anything the first year or so after conversion, obviously there will come a time when the consumer will become selective and buy only those products needed most. Among these she will select those which offer improvements which serve her best.

The test check which this company made covered vacuum cleaners, toasters, electric irons, electric ironers, waffle irons, washing machines, electric mixers, and was first conducted in Los Angeles suburbs by members of the O. K. Fagan Advertising Agency.

The approaches made to the problem were interesting. Several were tested. When asked what improvements they would like to see in a vacuum cleaner or other products, it was found that women responded poorly but did rise to the occasion when asked, "What do you find wrong with your present vacuum cleaner?" This did not necessarily mean that women were unintelligent but that they did not visualize improvements. Once the specific improvement was mentioned they had a quick answer about it.

A quick survey, it was decided, would not reveal complete enough information. Best survey calls were completed after the agency had worked out a method of giving the women a number of possible improvements in the product and asking them to tell which of these they would like to see made, indicating first, second and third choice. Similar surveys were then turned over to other organizations to be made in Atlanta, Ga.; Indianapolis, Ind. and New York City and later in San Francisco and Oakland.

As a similar test, the company distributed at the May Co., Los Angeles, exhibit on the Fifth War Bond Drive a pamphlet in which those receiving it could tell of their "pet peeves." The company plans to manufacture some 24 products including vacuum cleaners, electric mixers, garbage disposers and other kitchenware items.

Answers to some of the questions are of interest:

Vacuum Cleaner:
1. Do away with dust bag.
2. Increase the suction.
3. Make easier to sweep under furniture.

Toasters:
1. Make crumbs easier to remove.
2. Add a control for toasting bread "soft" or "dextrinized".
3. Make larger toasters—holding more than two slices.

Electric Irons:
1. Make cord so that it won't twist.
2. Make heat control dependable.
3. Make identical iron with choice of weights.

Electric Ironers:
1. Make it easier to iron sleeves, children's dresses and other difficult garments.
2. Do away with steam pouring up in face.
3. Make ironer lighter in weight and easier to handle.

Waffle Irons:
1. Make iron stick-proof.
2. Add a warning bell or signal when waffle is about to burn.
3. Make heat control dependable.

Washing Machines:
1. Make improvements in thoroughness and ease of rinsing.
2. Make rollers of material that will not deteriorate so rapidly.
3. Make top of glass.

Electric Mixers:
1. Make it easier to clean.
2. Make smaller and less cumbersome.
3. Sell for less money.

Answers given to question, "After war which of your appliances are you going to replace first?" were:

Vacuum Cleaner	21.1%
Iron	15.5%
Washing Machine	9.9%

Answers given to question, "After the war, which appliance (not now owned) are you going to buy first?":

Washing Machine	16.9%
Electric Mixer	14.1%
Vacuum Cleaner	8.5%

● A "DEALER DIGEST" is being issued monthly by Landers, Frary & Clark to all dealers who have signed up on its "U Plan for V Day." It plans to give dealers information on the status of civilian production of appliances, postwar information, sales hints, etc.

● THE HOPE of Pacific Coast manufacturers in competition with those from the East was stated at the first session of the Los Angeles Chamber of Commerce's free consultation service established as a once-a-week event for manufacturers planning to convert in the postwar era to production of consumer items. That statement was, "Make items on the Pacific Coast so totally different and of such quality that they will sell throughout the United States." It is expected quite a number of such war plants may go into appliance manufacture.

Appliance Selling

"While a shiny new car was parked at the curb for the neighbors to admire and the radio was bringing a new world into the home, the appliance salesman was going from door to door talking about hiding a washing machine in the basement, or a refrigerator in the kitchen, or even telling about new-fangled types of flat irons," said V. E. "Sam" Vining, on loan to the War Finance Committee from Proctor Electric Co.

"There are some people, of course, who will argue loudly over my statement that appliance selling has kept pace with invention and manufacture. They point to great reductions in cost of manufacture of appliances and insist the cost of selling shows no similar improvement. In fact, I have attended meetings where sales departments were put on the pan and told bluntly that 'cost of selling' was all out of line with other costs—and must be lowered. These critics of our selling costs forget two or three things:

"1. There has been no reduction in cost of manufacture except through replacement of manpower with machinery.

"2. No one has invented a machine to replace personal selling.

"3. Selling costs are figured in dollars—not discounts; — and as long as the public insists on choice of brand, displayed in convenient locations and deliveries the day of purchase, even increased volume affects costs only slightly.

"Personally, I look for no revolution in sales methods or great change in sales channels other than those already in sight as some appliances become store items because of increased consumer acceptance. Even these changes will not replace the effectiveness of cold canvass. House-to-house selling will always account for tremendous volume in every appliance from flat irons to ranges," Vining concluded.

Washer Display Hints

How to set up an attractive and effective washing machine display or department is now being told to dealers through a personally distributed plan book prepared by the Easy Washing Machine Corp. A large folder contains practical working display plans complete with color drawings, architect's sketches and full construction details for building the department. In it the dealer is urged to plan for such a department and get it built now.

Having been developed through conferences with retailers, architects and display men, the layouts are simple enough to construct or supervise by any store display man or store owner. There is a plan for every type and size of store and appliance department from an elaborate layout to a simple corner.

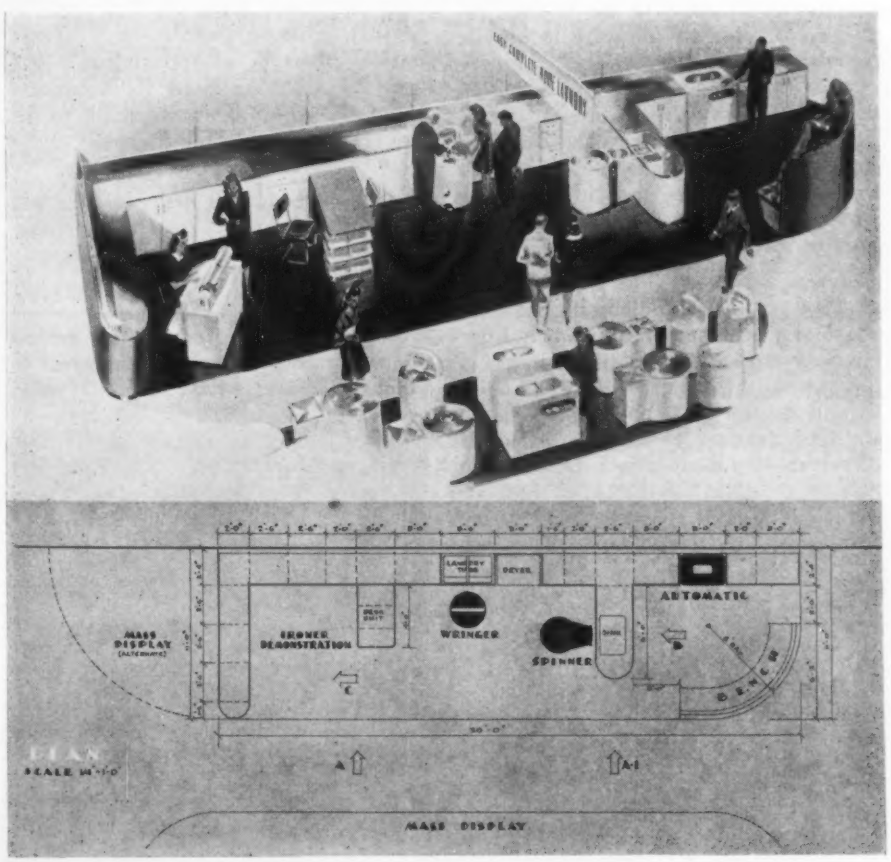
The field organization of Easy Washing Machine Corp., headed by Fred Fenton for the Western region, is now making calls on dealers to present them with a set of these plans and to discuss the possibilities with them.

● A MARCH OF TIME film, *Postwar Farms*, dealing with the benefits of rural electrification, has just been announced. However, it deals largely with the REA financed electrification program and is therefore more pertinent to areas where electrification of farms is relatively new and untried than to highly electrified Western farms.

● BETTER DEALERS to sell farm electric equipment is the aim of the booklet just produced by the *Farm Journal* by Frank E. Watts, executive assistant, former electrical magazine editor, and made available to dealers or utilities. It outlines a plan by which a dealer can develop his farm equipment business along sound merchandising lines.

● WALTER B. LLOYD Co. has just opened a new electrical appliance store at 307 S. Fourth East, Salt Lake City. Lloyd, former commercial sales manager for the W. H. Bintz Co., and V. A. Smith, former district manager for CIT Corp. for Utah, Idaho and Montana, are owners of the company, assisted in repair and installations by Frank Warner, former refrigeration repairman for the Bintz company. At present the company is busy in industrial and commercial refrigeration in Utah, Nevada, Idaho, Wyoming and even Oregon. Looking forward to quick-freeze equipment, the company plans to handle all types of appliances as well as to specialize on commercial refrigeration.

One of the plans in a display booklet distributed by Easy Washing Machine Corp.



W. I. Terry (center) and W. V. Nuttall, Pendleton Builders Supply, with J. H. Valentine, left, of the A-B Stoves Co.

● W. I. TERRY, for many years a salesman with Utah Power & Light Co., has gone into business for himself as a distributor of appliances in Utah and Idaho. Operating under the name of the Pendleton Builders Supply Co., he has opened offices on the ground floor of the Atlas Building, 36½ W. Second S. St. in Salt Lake City and a repair shop at 52 E. Fourth S. St., where three men are employed repairing all types of appliances. Assisted by two salesmen, he is handling a line of equipment including A-B electric ranges; H. C. Little furnaces, heaters and water heaters; International water heaters; Gilco water heaters, furnaces, ranges and heaters; Research air filters; Proper air blowers.

● THE EVENING CONCERT, long sponsored by Pacific Gas and Electric Co. over station KYA every evening from 8 to 10, was discontinued recently, according to an announcement from the company. The record program of fine music was taken over by the utility five years ago and received much favorable comment. However, recently news interruptions have been made in the program and it was also felt that the area covered by the station was too limited to represent the company throughout its entire area.

● UNIVERSAL line of small appliances and vacuum cleaners will be made by the Amalgamated Electric Corp., of Toronto, Canada, and distributed throughout Canada and Newfoundland by Northern Electric Co. which will also have exclusive distribution of American made Universal electric appliances, according to Landers, Frary & Clark president, R. L. White.

● BENDIX RADIO has taken space at the Western Merchandise Mart in anticipation of future business. J. C. Wilson is in charge.

This glass kitchen is being demonstrated in the West by Libbey-Owens-Ford Co.

Glass Kitchen

The glass kitchen is touring the country, being demonstrated at large department stores in the major cities. Typical was the way it was billed and the response it received at O'Connor, Moffatt and Co., San Francisco, where it was on display for two weeks for seven demonstrations a day.

In the first week 39,623 people visited the display and the second week there were almost as many. Miss Bonnie C. Duke, exhibit supervisor of Libbey-Owens-Ford Glass Co., Toledo, Ohio, was assisted by Miss Luella Osborn, home economist of Pacific Gas and Electric Co., on occasions.

Cresslyn L. Tilley, merchandising manager, O'Connor, Moffatt and Co., was highly pleased with the interest displayed in the spectacular kitchen. For some time he has been endeavoring to get samples of possible postwar appliances in order to keep alive the interest in the company's home appliance department. These were not available and the glass kitchen proved an exceptionally good stimulant to keep the public aware of home appliances. The store intends to do big things in home appliance merchandising after the war, devoting more of its space to such department.

● MUSIC WHILE AT WORK has definitely been commercialized and is available on a monthly basis through the establishment of several branches of Muzak in the West. The San Francisco agency is known as Muzart Co. at 849 Powell St., operated by Associated Broadcasters and Station KSFO. Sound equipment is installed in a factory or office which is fed over a private wire system. Music is of a character which is cheerful yet does not call attention to itself and distract the workers. It is said to create a more harmonious atmosphere among workers, especially those doing routine or fatiguing types of work. The system also operates as a public address system wherever installed.

● THAT SINGLE-ROOM fractional horsepower air conditioners or room coolers will prove to be one of the fastest growing postwar appliance markets is predicted by Philco Corp. Although the entire industry sold only about 40,000 of these units a year before the war, Harry Boyd Brown, manager of air conditioning, feels that the performance, service and utility of these conditioners have been such that the demand for them will be greatly increased as soon as they are available. He also announces that the company expects to make units at a lower price than before the war. The units will be lighter in weight and more easily installed. Each home may be a prospect for several to cool individual rooms and to provide air filtration for victims of hay fever, asthma, etc.

● TO KEEP the public coming through its doors, whether it has much merchandise to sell or not, against the day when it will have plenty, Hockett Cowan Music Co., Fresno, offered the walls of its store to a group of wives of servicemen located in Fresno for an exhibit of their paintings. A number of the paintings were sold and the proceeds were donated to charity, a "Fresno Nutritional Children's Home." The entire idea was "very satisfactory," said Cowan.

● A SHOWING of Christmas merchandise at the Western Merchandise Mart was held Sept. 13, 14 and 15 from 9 a.m. to 6 p.m. It featured gifts, toys, cabinets, art goods, jewelry and lamps now available from former distributors of appliances and housewares.

Co-op Seeks Sales

Indicating the nature of competition which dealers will have from cooperatives is a recent bulletin of the Berkeley Cooperative Union, Berkeley, Calif., which, in addition to announcing a new appliance repair department and one for radios, asks its members and customers to make advance deposits on new appliances so that these deposits may assist the co-op in getting its share of new appliances when they are available. "So that you will be assured of the equipment you need, we suggest you order and pay for the appliances now. Our prices will be competitive, with satisfaction guaranteed, or your money cheerfully refunded. Pay smaller amounts weekly or monthly—but those with half or more paid in will be given preference when they arrive."

The repair departments are merely agencies for repairs, the members being asked to leave their appliances or radios and they are to be handled "through a reliable wholesale agency."

Another interesting item is an appeal for help. "We are in real need of some volunteer help at the hardware and appliance store. With our limited staff it is impossible to do all the work that is necessary at this time. The new departments, and additional stock, involve a great deal of renovating and new shelving. We urge that you give a few hours of your time to help out now. Even an hour can be of real value to your co-op." These indicate the type of appeals made and how costs are reduced by voluntary assistance which is not available to the dealer in business for himself.

● CONOVER electric dish washers will be handled at the Western Merchandise Mart in a new space recently taken by LeMar Piper.

Good will was created by this exhibit of paintings by servicemen's wives in Hockett Cowan Music Co. at Fresno

Service Centers

G-E offers expanded facilities to dealers

Reporting that its facilities are now expanded, W. J. Kern, district service supervisor for General Electric Co., San Francisco, has explained the extent to which dealers and repair shops may call upon the central service facilities and repair shops of his organization to give adequate and speedy service to their customers. Repairs which for any reason are too difficult for them, or on which dealers wish to retain their contact with their customers by accepting repair jobs, may be sent to either of the two appliance service centers in San Francisco and Los Angeles or to contracted representatives in Seattle and Portland. The dealers receive their usual markup on the parts used and the job is non-competitive with their own departments.

At San Francisco at 351 Bryant St. are located the district office, the appliance service center, the refrigerator reconditioning factory and regional warehouse serving distributors with supply parts for refrigerators, ranges, home laundry, water heaters, disposalls, dish washers, automatic blankets and with parts for heating devices, sun lamps, mixers, dehydrators, fans, vacuum cleaners. Refrigerator units either new or rebuilt and repair shop facilities on heating devices, mixers, vacuum cleaners, fans, dehydrators, range timers and automatic blankets. The complete rebuilding of all types of G-E household refrigerator units is also conducted here. J. R. Davis is its manager, H. M. Parmley, Jr., operations manager, and M. C. Ross, assistant manager. R. E. Moore is superintendent of the refrigerator reconditioning plant.

Repair shop in the G-E appliance service center at Los Angeles. Dealers and repairmen may send difficult jobs here and to the San Francisco service center

At the Los Angeles plant service center is a warehouse serving distributors, dealers and consumers for supplies of parts for refrigerators, ranges, home laundry, water heaters, dish washers, disposalls, heating devices, sun lamps, automatic blankets, mixers and dehydrators and new and reconditioned refrigerator units with repair facilities for heating devices, sun lamps and mixers. W. K. White is the manager of that center with C. R. Eck, operations manager. It is located at 701 Banning St.

In Seattle the Electrical Engineering Co. is under contract for repairs and parts for all types of heating appliances and small appliances and in Portland Morrison Electric Co. is similarly authorized. The field organization, headed by Kern, with J. Dreyfuss, product service representative, makes periodic contact with distributors and dealers, presents the service training schools and supervises the home study courses offered.

● A MORE FLEXIBLE "Health for Victory" course has been announced by Westinghouse beginning Sept. 1. The monthly meal planning guide will be replaced by a year-round guide of 104 pages. This will make the program more flexible in that it can be given at any time, once a day for six days, once a week, once a month or at any desired interval. A new kit and other features are being developed to augment the use of this guide in Health for Victory classes. The entire course now is packaged as a unit and is offered as such.

● HOME PLANNING INSTITUTES in northern California are scheduled to start Oct. 3 at Santa Rosa, Oct. 10 at Salinas, Oct. 11 at Watsonville and Oct. 19 at Stockton. Plans are also under way for a number of institutes in the East Bay region.

● THE TRADING POST of The Washington Water Power Co. closed July 21 after having sold 1,210 items or a total of $6,147.20.

Public Service Co. of Colorado appliance service men at Cheyenne recently remodeled the company's service shop themselves, building and installing new work benches, storage lines and rearranging equipment to permit more efficient handling of the ever increasing demands for repairs and service. Shown are the well-equipped work bench, left, and the parts bin. Center: Clarence Geile, Glen Maughmer, Louis Furlon, and "P. V." O'Kelly

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
68 POST ST. SAN FRANCISCO . 4

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Power to Sell

ONE of the great economic problems facing the Pacific Northwest at the close of the war will be to keep its power—its kilowatt-hours—at work. Conservatively 800,000 kw. of war load will be dropped. At 65% load factor, this amounts to 4.55 billion kwh. annually which must be put to useful work. This is more than the combined output of all of the major utility systems in Washington in 1940. It approaches a ten-year power supply at past rates of normal growth. If only a fraction of this available energy is marketed within a reasonable time, the load-building job becomes a herculean task requiring every bit of the available sales and promotional talent in the Northwest.

Bonneville proposes to sell a large block of this power at low rates for electric heating. This program at best could only account for a small part of the total. Moreover, electric power is a valuable public asset and many question its use in large blocks to do a mass heating job. Other uses must be developed for the bulk of the power — uses where the competition will not be so keen and where electricity can do the tasks for which it is so preeminently fitted.

The situation calls for mobilization of all selling capacity. Every sales agency, every distribution outlet and every kind of promotion will be required. Private and municipal utilities of the Northwest still serve practically all of the peacetime load of this area, and upon these systems will fall the major task of selling the excess power. It has been the private utilities who built Northwest average residential usage up to double the national figure. The Seattle, Tacoma and Eugene municipal systems have contributed to this effort. The Northwest utilities did the pioneering sales work on electric cooking and water heating and proved these usages nationally. And after gaining widespread public acceptance for these services, the utilities have gradually turned the sale of the labor-saving appliances over to the dealers.

Through individual efforts of the power companies and through their Northwest association, they have built up a dealer sales organization which is geared to carry the load in this postwar load-building job. No governmental glorified TVA could have performed this accomplishment.

The Northwest needs its utilities and it needs its dealers again to lead the way in intensive load-building as they have in the past. They are needed just as other private industry is needed as an economic balance wheel for the over-all welfare of the potentially great Pacific Northwest.

George Hughes—Benefactor

IN the passing of George A. Hughes—"Father of the Electric Range"— the Far West lost a staunch friend and advocate. It is doubtful if any man has made such a marked contribution to the electrical business of this area. Himself virtually a Westerner—at least in thought and experience, George Hughes had the courage to take the pioneering gamble, to brook the jeers and ridicule and to fight through to success.

It was in 1909 that someone mentioned to him the possibility of cooking by heated wire. He gave up his utility interests and went to Chicago to make this dream come true. With the help of an electrician, he converted an oil cook stove to a "wire cooker" took it to an electrical convention in St. Louis and came away with an order for the model and four others like it which had been assembled. The original ranges, fittingly enough went westward to Montana. Soon there was an order for a carload. Largely through his efforts electric cooking took hold in the Pacific Northwest, where its superior advantages and benefits to customer and utility were ultimately demonstrated.

One by one the electrical industry's pioneers are passing. George Hughes ranks with the foremost of them. And he leaves behind him a fitting monument — millions of homes equipped with safe, clean, fast, labor-saving electric ranges giving happiness and satisfaction to millions of housewives.

New Code in Making

BECAUSE it takes over a year to consider the changes, correlate them, sift and evaluate them before a new edition of the National Electrical Code can be brought forth, the electrical inspectors who met last month to consider such changes did well to regard the next Code as a postwar instrument. Nevertheless they were conscientious in wanting to improve the Code as a result of any wartime change that may have proved itself desirable to keep.

Every Code discussion time brings into focus the difference in attitude toward adequacy between the East and the West. This can be traced directly to the difference in usage of electricity in the two sections of the country. Out West where electrification has advanced rapidly and consumption per capita is high, the need for more adequate carrying capacity and protection for the system is felt long before it is in the East. That is why so many Westerners feel that the Code lags so far behind progress, for usage in this region has already made Code wiring obsolete. Yet the Code continues to be the least common denominator, made to fit the least usage. This clash of viewpoint will exist until usage of electricity in the East rises to match that in the highly electrified West. And it will likewise make it difficult to achieve the ideal expressed in the slogan, "Let the Code decide."

Who'll Want to Work

"HOW you gonna keep 'em down on the farm, after they've seen Paree?" was the song which expressed the big social problem at the end of the last war. When this war is over the question which all the energetic postwar planners are avoiding as if it did not exist can be said in about the same slang—"How we gonna get anyone to do real work after the big dough, the hideouts, the loafing in big war industry?" The words do not sing so easily but the problem isn't a very melodious one, either.

Nursed on the idea that "Uncle's rich so why should we care," by an indulgent, self-perpetuating administration, a whole generation has been brought up to boondoggling. The desperate needs for manpower to make war materials have caused employers to beg everyone to work even a little, have made them lenient to the point of spinelessness in order to try to hold help, to pamper and humor every whim and demand.

When ordinary people start buying products with their own money can they stand the load of "take-it-easy" production labor in the price of the commodity? If costs are high, prices must be, too, and volume will sag. There really will be a law of diminishing returns which can't be repealed like prohibition.

Many people *have* worked very hard during these war times, else the production of war goods which turned the tide never would have been accomplished. These real workers, whether in overalls or white collars will be in demand by industry and business. Whether industry should shoulder the burden of employing the lazy millions who only want the pay check, not the job or the work. is the serious problem. It is a high price to pay for freedom of enterprise for the enterprising. Yet, if it is not paid, the politician will mobilize this spoiled and pampered mass of humanity with promises of government manna and seek to wheedle government into taking over industry on the excuse of providing "employment."

This is not a wholesome postwar problem to contemplate. But it is one to which real thought should be given, on which real planning should be done.

IN the midst of all these historic stirrings, American industry is trying to keep its balance and its head. It has solved one great problem and is now facing another equally great. The first was war production. The second is reconversion. In the production of war materials, all that is necessary now is to keep the wheels rolling at top speed wherever required. We now, unquestionably, have the productive capacity to finish the job. Perhaps you are amazed that this is so. Perhaps it never occurred to you that a nation such as ours, saddled, some say, with a flabby democracy and an old-fashioned system of private capitalism and profit and loss could accomplish so much in so little time. Perhaps you never suspected that the managers of industry, besmeared and bewildered and kicked around for years by young bureaucratic bright-eyes, would come through. But these things have come to pass, to the wonder of the world. Not only has American industry supplied the needs of our own vast army and navy and air forces, but it has sent guns and ammunition and tanks and airplanes and clothes and food to the armies of our allies all around the world. All of this has been accomplished by what for want of a better word, people call private enterprise, but which really is American enterprise.—Tom M. Girdler, chairman of the board, Republic Steel Corp. and Consolidated Vultee Aircraft Corp.

Southwest Section Studies Code Changes

Inspectors concentrate attention on Code revisions at Santa Cruz meeting; E. E. Larson elected president of Southwestern Section

CROWDED against a September date line for final submission of any changes which would be considered in the remaking of the National Electrical Code, the Southwestern Section, International Assn. of Electrical Inspectors, devoted its entire meeting, Aug. 28 to 30, at Santa Cruz, to the Code. Only four papers were presented, each of them brief.

The Southwestern Section had plenty of changes to consider. Its article committees had submitted and Secretary-Treasurer Harold Gerber had correlated some 34 mimeographed pages of them. Except for the opening and closing business sessions, the entire time of the annual meeting was spent discussing these changes, and even so many had to be referred bodily without discussion to the article committees of the Electrical Committee.

Of the papers presented, that by R. R. Cowles, electrical engineer, Pacific Gas and Electric Co., San Francisco, likewise recommended Code changes. Dealing with overcurrent protection for three-phase motors, it showed the necessity for providing protection on all three phases. Used extensively in agricultural pumping installations, the economy of three-phase distribution for such areas has been proved. However, should a fault occur on a three-phase line which would cause a phase to go out leaving the line single-phased in operation, undue voltages might occur on the one unprotected phase and burn up the motor. The present requirement for fuse protection or circuit breaker protection on two of the phase legs only does not operate under such conditions and a motor can be burned up before the entire line opens. His paper advocated requiring in the Code that all three phase legs be opened simultaneously when overcurrent occurs.

The other papers were in the nature of a recess from the intensive Code discussion. Joseph J. Siddall, electrical engineer, H. H. Robertson & Co., Pittsburgh, gave an amusing and pertinent talk regarding building codes. Building codes, he said, have not kept pace with changes in the art, the way the National Electrical Code has done. Since electrical usage is rapidly advancing and the building itself is static, he urged that more facilities be provided in the original building

E. E. Larson, Riverside, was elected section president at business meeting

structure to make electrical usage more flexible and adaptable to the progress it is making.

How high-frequency electric heating is being used now to prepare plastic materials before they are cast into wiring device parts or outlet boxes, was disclosed by Fred P. Oliver, Union Insulating Co., Parkersburg, W. Va. Such pretreatment of plastic materials makes them more fluid, improves the molded product and gives it greater strength.

Even the Monday noon luncheon was related to the Code in that its speaker, Robert B. Shepherd, electrical engineer, Underwriters' Laboratories, Inc., New York City, chairman of the committee investigating substitute materials and wiring methods as a post-war committee of IAEI, reported the results from a questionnaire which had been sent to inspectors throughout the nation. Returns of 7% had been received from 2,000 questionnaires sent to active inspectors only. These came from 35 states and the District of Columbia, the largest number of which came from the Southwestern Section.

W. W. Beeler was meeting chairman

Sixteen questions were asked seeking information as to experience or opinion on the continuation of interim amendments 43, 44, 49, 56, 70, 71, 74, 79, 81, 83, 84, Interpretation 229 and, likewise, asking for experience with the use of pressure connectors instead of solder. Questions were also asked whether iron current-carrying parts in wiring devices should be continued and whether enameled electric metallic tubing was satisfactory.

Among the results reported it could be seen that no inspectors favored continued use of iron in current-carrying parts. Very few favored the use of thinner metal for outlet boxes or enamel on electric metallic tubing instead of zinc coating, or general use of No. 20 lamp cord. Acceptance was good for wire connectors except of the fixture type. Higher voltages for lighting circuits were favored, service entrance cable for range and water heater circuit wiring also, No. 8 wire ground for grounding rather than No. 6 was acceptable to 66% of those answering. Opinions as to the machine tool Article 670 were a draw, many asking for revisions. From the questionnaire Shepherd observed that electrical inspectors were somewhat cautious about the unknown but willing to change their minds when shown good reason.

Presidential addresses at the beginning of the meeting were brief. President N. J. Siggins, electrical inspector, Electrical Department, City and County of San Francisco, modestly confined his remarks to a welcome of the members to the meeting, a regret of the inability to present interesting and instructive papers and an admonition to inspectors to furnish leadership which would prevent a breakdown of the standards for the protection of life and property.

IAEI President J. D. Lynett, supervising chief inspector, Department of Water Supply, Gas & Electricity, City of New York, spoke informally in a "shop talk." He called for plenty of discussion over the Code, saying that the job of the inspector was far from done; that when the war ended it

Hill Rice Veit Tretheway Dean Dobson Ufer Rice Weber Siddall Benz

would just begin for standards have been dropped too low. Reviewing past war experience, he showed where fire losses increased after the war had caused a dropping of installation standards and predicted the same would occur in this war unless inspectors were alert.

Of the association's future he spoke frankly. He called for a self-supporting organization which would raise enough of its own funds to carry the secretary's salary and even provide him with assistants. The association should be able to do considerable research, he said, and it would need to be well financed to carry on this work in an independent manner.

Harold Gerber, secretary-treasurer of the section, reported a grand total membership of 562, of which 245 are active, 238 associate A members, claiming the largest percentage of active members of any section.

Electrical fires have shown an increase since the war, observed Harry V. Dobson, Santa Barbara electrical inspector, in his annual report on electrical fires. An interesting point; fires charged to the electric iron had been dropping off because of the automatic iron from year to year until the war curtailed new manufacture. Since manufacture has stopped and old, discarded irons have been repaired and resold the percentage of fires has arisen again to the 1940 figure. A sharp rise has been noted in fires caused by appliances, too. Average loss has been $486 per fire.

Despite greatly increased industrial activity, George Kimball, electrical engineer, Industrial Accident Commission, reported a slight decrease in the number of industrial fatalities due to electric current. Main causes of electrical accidents are portable tools—which not only present an electrical hazard but sometimes during shock subject the operator to serious physical damage from the tool itself—non-horsepower rated switches on motor loads of 440 volts, welding circuit receptacles blowing up, uncovered trolleys for hoists and cranes and, most serious of all, contact with high voltage overhead lines by cranes, derricks, pile drivers, etc.

At both Code breakfasts, Tuesday and Wednesday mornings, the subject of lighting in spray booths was hotly discussed. Some inspectors chafed under the rigid rules which require explosionproof lighting equipment if used at all in or around a spray booth while others cited instances of serious explosions and fires from explosive vapors and pigments present in such places. Finally a request was made that a special technical subcommittee study the subject and work for revised Code rules. It was pointed out that the subject is complicated by virtue of the nature of volatile gases, solvents and pigments used in such spray booths or spray rooms. Spray painting is used so extensively for such a variety of operations that inspectors are constantly under pressure to relax their requirements.

Another topic at the Code breakfast was protection of circuit wiring from the secondaries of high-voltage transformers serving cold cathode or neon tubing used indoors. With a possible use of this type of lighting on the interiors of buildings quite extensively inspectors were concerned over the voltages, the milliamp. ratings and the protection afforded the public in such installations.

Another topic at a Code breakfast was that of diversities allowable on electric ranges where used on three-phase, four-wire network distribution systems rather than the customary single-phase system. In the former the neutral carries more load and it was pointed out should be calculated to be sufficient in size to do so.

An answer to the grounding of portable appliance problem was discussed at some length by Victor H. Tousley, secretary-treasurer, IAEI. He proposed that the present two-prong attachment plug be redesigned to provide a third prong at right angles to the other two and retractable in the plug. Appliances then would be fitted with three-wire cord attached in a manner to provide a ground circuit. Receptacles would be provided with a grounding socket for such a receptacle prong and this could be connected either to the metal raceway of such a system for grounding or to the neutral wire for grounding if found desirable. Since the connection would be made inside the outlet box, there would be no chance of the neutral inadvertently being switched for a hot leg and thus livening up the appliance. Tousley's proposal was endorsed in principle by a resolution at the end of the meeting.

Articles 210 and 220 drew the most argument in the Code discussion. They were delayed in being presented because a new copy of a proposed revision of these two articles had just been received from IAEI and the local committees had not yet had an opportunity to digest these changes. Therefore, the discussion was held over till Wednesday morning. Except for details in regard to other paragraphs the discussion centered around four recommendations presented by the Southwestern Section article committee

Robert B. Shepherd, New York City, reports on TAEI postwar questionnaire

Shepherd, Gerber and Siggins

headed by Arthur Kempston, Pacific Coast Electrical Assn., its chairman. These were as follows:

1. **That all receptacles be installed in exclusively receptacle circuits, that such branch circuit conductors be not smaller than No. 12 and be protected by overcurrent protection not greater than 20 amp.**

2. **That all branch circuits in residential occupancies have conductors not smaller than No. 12.** (Inspectors, however, demanded that lighting circuits still remain fused at 15 amp.)

3. **That non-combustible insulation be required on all cords used to supply portable appliances, equipment and devices.** (Only valid objection to full use of No. 12 wire had been found to be that cords could cause most of the fires and that they often burn up before the fuse opens. In recommending non-combustible insulation the chairman declared it was available and could be provided on all appliances to the improvement of the appliance and general service of electricity.)

4. **That such cords be not smaller than No. 16.** (Cords smaller than No. 16 can short circuit and burn up before the fuse operates if the cord is long. Resistance in the smaller wire is sufficient to retard the flow of current through the fuse but not sufficient to carry the dead short and thus the wire burns.)

With these provisions the committee maintained all objections to full use of No. 12 could be overcome. These recommendations were heartily approved and recommended to the article committee for revision of the Code.

Time did not permit of discussion of a comprehensive revision proposed for Articles 420, 430 and 440, dealing with wiring to motors. This committee, headed by Frank Short, electrical engineer, Industrial Accident Commission, Los Angeles, sought to bring into conformity with the long established rules of the Electrical Safety Orders of California the present rules of the National Electrical Code. These articles, like several others, were referred bodily to the respective Code committees for consideration.

Briefly sketched, some of the topics touched upon in the Code discussion were as follows:

Need for a better definition of "continuous load."

Clear understanding of what the difference is between master service, subservice and feeder.

Height for the point of attachment of services to the premises. With a style trend in California bungalows for very low roofs the problem of maintaining safe clearance of service wires above ground is highly aggravated.

Protection of knob and tube wiring where thermal insulation is installed in a house, particularly old houses where insulating materials are blown between joists. Such materials absorb moisture and provide a hazard.

Elimination of bare bus riser shaft. This matter was referred to a technical subcommittee for study.

There was also brief discussion of the new Article 725 which deals exclusively with signal circuits.

Two of the rare honorary life memberships in IAEI were presented to two retired inspectors of the Southwestern and Northwestern Sections during the dinner Tuesday night. Fred Weber, secretary-treasurer of the Northwestern Section since it was founded, a past president of IAEI, retired in April and now residing in Pasadena, was presented the first such life membership. R. H. Manahan, former chief of the electrical division, Los Angeles, also a past president of IAEI and still representing the Southwestern Section on the Electrical Committee, NFPA, was presented the other.

Mrs. Kimball, IAEI President Lynett, with Mrs. Lynett and Mrs. McClelland

At the closing business session E. E. Larson, electrical inspector, Riverside, was elected president. M. C. Sandles, chief inspector, Oakland, was advanced to first vice-president. H. G. Ufer, Western superintendent, Underwriters' Laboratories, Los Angeles, was elected second vice-president and Secretary-Treasurer Harold Gerber was re-elected. The executive committee includes the above with retiring president, N. J. Siggins, O. D. Butterfield, electrical inspector, Torrance, Clifford Prudhomme, Sacramento chief inspector and J. A. Hill, Pacific Gas and Electric Co. R. H. Manahan was re-elected member of the Electrical Committee with B. C. Hill, superintendent, Electrical Division, Oakland, as alternate. Members of the executive council elected were George Kimball and R. W. Wiley, chief, Department of Electricity, San Francisco.

Warm tribute was paid to W. W. Beeler, electrical inspector, Santa Cruz, general meeting chairman, and to his assistants, notably Milo Cain, Coast Counties Gas & Electric Co., for convention arrangements under war difficulties. Len C. Rausch, district manager, Coast Counties Gas & Electric Co., welcomed the meeting on behalf of the industry, commending local cooperation in the electrical industry. Registration totaled 96 of which more than 80% were active inspectors.

In all the 21st annual meeting was a concentrated one and fully justified itself as essential in preparation for future wiring and for handling the problems brought about by a lowering of standards during the war.

To assist in taking down the transcript of all discussion at the annual meeting of the Southwestern Section, International Association of Electrical Inspectors, the secretary made use of the new General Electric Co. wire recorder, loaned by the electronics department of G-E Co. in San Francisco. Future possibilities of this device were well forecast by the success with which the device was able to pick up not only the exact words of the speaker at the stand but questions and comments from members of the audience some distance away. Capable of being replayed as often as desired by means of rewinding and playing over again, every detail could be recorded and transcribed.

George M. Boyd, Westinghouse lighting application engineer in Seattle, gave an address before the Advertising and Sales Association of Spokane Sept. 20 on *Street Lighting—194x*. This was in line with the educational campaign of the National Electric Manufacturers' Assn., which is stressing two points: relationship between adequate street lighting and the reduction of traffic accidents; proof that the type of street lighting used in the past is not the type which produces best visibility.

R. H. Manahan and Fred Weber examine honorary life membership papers

Contractor's Suit Dismissed

Significant statements in decision will have bearing on association conduct for years to come

"The weaver may weave many strands into his web; each may add to the pattern, but the product of the loom is the completed fabric." With this analogy U. S. District Judge Leon R. Yankwich dismissed the case against the San Francisco and the Alameda and Contra Costa County Electrical Contractors associations, two locals of IBEW, No. 6 and No. 595, the officers of each and many of the corporations and companies which are members of the associations to end the five-year suit against these 40 individuals and associations charging violation of Sec. 1 of the Sherman Anti-Trust Law.

In the judge's decision a number of significant statements were made which will have a bearing on the conduct of the Electrical Contractors Assn. for many years to come. Among these are:

1. That construction as such is local and therefore intrastate in character;
2. That the materials used in a construction job have come to rest in the state and therefore are not in interstate commerce nor do they affect it;
3. That any effect on interstate commerce is minor and incidental;
4. Limitations of bidding as to time and persons, are no more a restraint on interstate commerce than is territorial restriction of outlets for dealing in articles originating in interstate commerce, such as automobiles, and the servicing and selling of supplies;
5. That employers and employees should be able to join in exercising control over bidding in order to stabilize a purely local industry or craft, when by so doing they are not increasing the resale price of a specific article originating in interstate commerce, and
6. That individual defendants may not be held criminally responsible for the acts of their groups which they did not either commit, counsel, encourage or direct.

These portions of the decision by Judge Yankwich also give support to the National Electrical Contractors Assn.'s claim against the Office of Price Administration that construction cannot be classed as a commodity with a definite price and, likewise, that it is not in interstate commerce.

The statements themselves directly bearing on this point are as follows:

"The electrical contractor does not buy articles in interstate commerce for resale. He buys them locally, for his own use in building electrical systems.

"When he bids on a job, he agrees to install an electrical system. His charges are for the completed system. Into the making of his price go electrical articles, cost of the labor of others, his own engineering skill in installing the various parts and combining them into a working whole, his own cost of doing business, and his profits of management.

"In other words, the electrical contractor processes the electrical articles into a combination which he sells at a price, in which enters as only one of the elements, the price of the articles."

In a later elaboration of this point, he brought out that in buying articles the contractor employs them to the extent needed in the completion of the job but returns any unused articles or materials to his own stock and does not credit the contract price for any such articles.

History of the Suit

The original indictment was returned in December 1939 and, because it was found faulty, a new indictment was returned March 2, 1940. In it the Grand Jury charged that the contractors and unions combined to fix prices on electrical equipment moving in interstate commerce, excluding such equipment from the San Francisco market and increasing the cost of it in interstate commerce in violation of Sec. 1 of the Sherman Anti-Trust Act. Specifically the charges in the indictment read.

"In an unlawful combination and conspiracy (a) arbitrarily, unreasonably, and unlawfully to increase, regulate, fix, dictate, and control the bids which all electrical contractors should submit to general contractors for the installation, alteration, and repair of electrical systems for the purpose of establishing arbitrary, collusive, and non-competitive bids, and (b) arbitrarily, unreasonably, and unlawfully to eliminate electrical contractors who refuse to participate in said bid-control scheme as prospective purchases of electrical equipment shipped in interstate commerce into the San Francisco Bay area and (c) arbitrarily, unreasonably, and unlawfully to increase the cost of electrical equipment which has been shipped in interstate commerce into the San Francisco Bay area and of the installation, alteration, and repair of aforesaid electrical systems to ultimate purchasers, and (d) arbitrarily, unreasonably, and unlawfully to restrict the amount and volume of electrical equipment shipped into the San Francisco Bay area in interstate commerce from others of the United States."

For two years the contractors indicted and the unions sought to have the case brought to trial. Delays were asked at each instance by the Department of Justice and when the war came on the contractors then asked that the cases be held over until after the war.

Finally Judge Roach, of the District Court in San Francisco, before whom the previous hearings had been held, took the case off the calendar. In July it was put back on the calendar for hearing Aug. 15 and dismissal of the case was made by Judge Yankwich on Aug. 31 after two weeks of testimony from government witnesses only. In dismissing the case, the judge held that the evidence was insufficient to hold the witnesses or to require the defense to present its case.

In making the decision, Judge Yankwich reviewed the law quite completely. He differentiated between this type of case and many others. At one point he said, "Workmen have their right to organize. Employers may combine for the mutual protection of their interests. Employers and employees may bargain collectively. They may, in so doing, or in enforcing their demands, by strikes, lockouts, restrictions on the use of men or equipment, affect the flow of goods in interstate commerce." But he pointed out that decisions and amendments to the act exempted such cases from the anti-trust law.

He next reviewed the operation of the bid depository system, which required registering of bids at a central office, a closing time for bids, and a freezing of the job and prices for a period of 90 days. Obedience to these provisions was secured through fines or awards of liquidated damages under an arbitration submittal plan.

The judge pointed out that, even within this pattern, there was competitive bidding. The general contractor was not required to use the depository and if he did he could award the contract to any bidder in the depository, high or low. Or he could choose his bidder from a free lance.

He also differentiated between this case and the New York case in that

there was no agreement not to work or actual refusal to work on electrical equipment originating out of the state.

Where the rules of the association required a computation of prices based on a formula described in the Electrical Price and Data Book, the judge made this point. "Concede that it was made according to formula described in the Price and Data Book, and that it would fall under the interdiction of the price-fixing cases adverted to, if it were a separate transaction. Yet, it is not such, but is a part of a broader undertaking to do electrical construction, in the completion of which the materials may be used. It is integrated into the whole and cannot be severed from it."

In view of the general invasion of the field of intrastate matters by the federal government another statement of Judge Yankwich was notable.

"On the whole, I think that judicial precedents interpreting this act and the more recent legislation related to it—some of the most important of which were announced after this prosecution was instituted—and the social goal behind this body of legislation—the maintenance of freedom of commerce between the states—stand in the way of its extension into the field which this prosecution seeks to invade."

As to the responsibility of any single member, Judge Yankwich concluded, "It is not the policy of the law to hold either individuals or groups criminally liable, unless their activities show clearly an intention to commit, aid, advise or encourage, willfully and intentionally, a criminal act."

In expressing the relief and pleasure of all the defendants over the outcome of the long-delayed case, George Abbett, president, San Francisco Electrical Contractors Assn., Inc., said, "We feel that we have been fully justified in our persistent stand to defend our rights under state laws and see this charge through. Many associations and groups, to avoid expense and the trouble involved, have pled 'no defense', taken a fine, and thus aided the federal government to step still deeper into state's rights. Our associations were organized legally under California laws; operated as strictly in accordance with legal procedure as human nature could be expected to, and so we felt this case involved issues that meant life or death to association work on a legitimate basis. It has not been easy to stand under the shadow of accusation for five years. It has been expensive in both money and time to fight this battle. But it has been worth it in the precedent it sets and the rights it reaffirms."

League Names Officers

An electrical contractor, Kimball Vance, owner and manager of Vance Electric Co., Salt Lake City, has been elected president of the Electrical League of Utah, succeeding Frank E. Bodine, who recently was made district manager of Westinghouse Electric & Mfg. Co., San Francisco. Vance has been vice-president of the league. R. W. Kimberlin, Salt Lake district manager, Graybar Electric Co., was named

Kimball Vance, Salt Lake City, elected president of Utah Electrical League

vice-president and Stanley M. Johns, who succeeded Bodine at Westinghouse, was elected to the board of directors.

Vance has been in the electrical contracting business for 13 years and has made installations in numerous large projects around Salt Lake City. He has been active in the affairs of the league over a good many years. He attended the conference of the International Assn. of Electrical Leagues in Detroit, Sept. 15-16.

IES To Make Study

An assignment of responsibility and importance has been given to the Northern California Section of the Illuminating Engineering Society by the parent organization. To prepare for future publication a complete study and analysis of the need for lighting in the canning industry, the group has been asked to act as a special subcommittee on lighting in the canning industry as a branch of the committee headed by H. B. Dates, chairman of the committee on lighting in the work world. For that assignment past chairman of the Northern California Section Romaine W. Myers, of Oakland, appointed Carl O. Martin, Benjamin Electric Mfg. Co., as chairman, with committee members Nathan H. Graves, Pacific Gas and Electric Co., Redwood City; Sam H. Hazleton, Jr., lamp department, General Electric Co., Oakland; Keith M. Noble, Pacific Electric Motor Co., Oakland, and Robert S. Prussia, U. S. Engineers. The committee is visiting canneries, familiarizing itself with canning processes, determining critical seeing areas and making a very thorough study of the results.

The Northern California Section held its first fall meeting Wednesday, Sept. 27, at the Engineers' Club, San Francisco, for the induction of new officers and discussion of the year's program. Newly elected chairman is Robert L. Dearborn, Kaiser Co., Inc., Oakland.

Joint Meeting In South

Illuminating and maintenance engineers of southern California will hold a joint gathering Oct. 18 when Cyril Prideaux, Austin Co., will give a talk illustrated with slides, *Installation and Maintenance of Lighting for Large Aircraft Plants*. Leonard Hobbs, manager, Smoot-Holman Co., will make a report on the standards for industrial fixtures being developed by a special committee of the War Production Board, of which Hobbs is a member.

The Illuminating Engineering Society, Southern California Section, got off to a bright start on Sept. 6 when Ralph Crump, section chairman, discussed the aims and policies for 1944 and '45 and new officers were inducted. Crump, of Smoot-Holman Co., succeeds Ted Shepherd, Los Angeles Department of Water & Power, illuminating engineer. The secretary of the section is L. W. Luley, Westinghouse Electric & Mfg. Co., with a board of managers consisting of Charles D. Gibson, State Department of Education; L. H. Hruby, lamp department, General Electric Co.; T. H. Shepherd; D. K. Grandey and William Spraker, Los Angeles County. William A. McGuire, Graybar, becomes editor of *Lights*, and Charles D. Gibson has the program committee chairmanship.

Programs for the year will stick strictly to lighting subjects. Plans include three industrial lighting meetings, two commercial, one for schools, one residential, one street and highway lighting.

San Francisco Pot and Kettle Club heard a talk on "Plans for Stimulating Sales of Housewares Postwar," by Thomas P. Ludcke, Pacific Gas and Electric Co., at its Sept. 15 luncheon. The club opened its fall series of meetings under Chairman Fred Wigmore, Hughson & Merton Co., and a new roster of officers.

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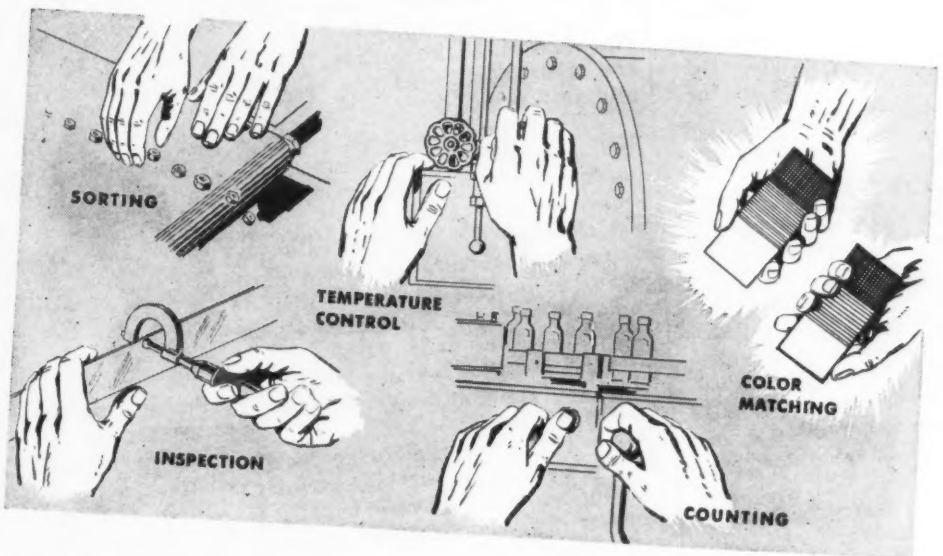
If you're interested, there is a man in *your* town you should see . . .



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PCEA *Panorama* — *Edited by Mary Shoop*

Conference Plans

Guidance Committees meet to formulate programs

AT two meetings held in Los Angeles and San Francisco, members of the guidance committee of the business development section formulated plans for the section's part of the fall conference program. Details are being worked out on the following topics:

1. A report of the code and ordinance committee.
2. A report of the adequate wiring committee, including information on the most successful home planning institutes.
3. A report of the newly appointed committee studying postwar lighting, including fluorescent and cold cathode.
4. An address by a representative of the field of chemurgy, who will explain the commercial application of principles developed in laboratory research.
5. An address by a representative of home financing agencies, who will discuss financing of appliances, terms, down payments and the possibility of including financing of major home appliances in the home loan.
6. An address by a representative of home financing groups, to speak on the value of the electrical installation as a protection of the long-term value of the home.

The newly appointed members of the guidance committee of this PCEA section are:

Milo Cain, Coast Counties Gas & Electric Co., Santa Cruz, chairman; H. C. Rice, Edison Co., Los Angeles, vice-chairman; W. E. Carlson, General Electric Lamp Dept., Oakland; T. W. Christensen, P. G. & E., San Francisco; H. A. Sandt, Allis-Chalmers Manufacturing Co., Los Angeles; W. P. L'Hommedieu, Westinghouse, San Francisco; E. W. Meise, San Diego Gas & Electric Co.; C. L. Moore, Chicago Flexible Shaft Co., Los Angeles; B. W. Reynolds, P. G. & E., San Francisco; B. M. Tassie, G-E, San Francisco; D. B. Wheelock, California Electric Power Co., Riverside.

● NEW MEMBERS of the guidance committee of the administrative services section are announced by the chairman, William de Waard, San Diego Gas & Electric Co.:

G. F. Maughmer, General Electric Co., San Francisco, vice-chairman; A. L. Code, Southern California Edison Co., Los Angeles; H. D. Cordes, G-E, San Diego; Charles Grunsky, Coast Counties Gas & Electric Co., Santa Cruz; Leon S. Heseman, California Electric Power Co., Riverside; R. A. Hopkins, Westinghouse Electric and Manufacturing Co., Los Angeles; A. J. Noia, Pacific Gas and Electric Co., San Francisco; H. H. Scoville, P. G. & E., Emeryville; F. U. Naylor, P. G. & E., San Francisco; M. W. Phillips, Edison Co., Visalia.

Members of the committee met in Los Angeles recently to organize the section's program for the fall conference. It was decided for the morning session to divide the section into five discussion groups—public relations, accounting, credits and collections, purchasing and stores, and personnel. Because today's conditions make personnel problems important in all lines, the section will meet as a unit in the afternoon for a consideration of personnel matters.

Electriquiz

J. E. Shull of the domestic sales department, Southern California Edison Company, Los Angeles, is the author of this interesting quiz. The answers are on page 108.

1. What percentage of the electric energy consumed by a Mazda lamp bulb is transformed into heat?
2. (a) The average human body at rest gives off how many Btus.? (b) This equals what size electric heating element?
3. The average factory worker produces with his own muscles, in his daily tasks, how much power in kilowatt-hours?
4. During the year of 1937, China, Germany, Japan and Italy were buying all the goods they could get from the United States in preparation for war.

(a) Which sum was the greater: Our total export in dollars value to these countries, or

(b) The amount spent by our own American householders for only the following: Electric laundry equipment, vacuum cleaners, ranges and radios?

● PRELIMINARY details on the conference program of the operating economics section were arranged at a meeting of the section's newly appointed guidance committee in Los Angeles. A list of possible timely subjects was compiled, and the ones will be selected on which the best speakers can be obtained.

It was decided that during the latter part of the afternoon, the section will join the administrative services section for the excellent personnel program that will be presented at that time.

Members of the guidance committee are: E. W. Morris, Westinghouse, Los Angeles, chairman; C. E. Baugh, P. G. & E., San Francisco, vice-chairman; C. J. Nevitt, San Diego Gas & Electric Co.; C. T. Malloy, Edison Co., Los Angeles; A. F. Ayres, California Electric Power Co., Riverside; Roy N. Phelan, ELECTRICAL WEST; C. E. Cunningham, Farnham and Cunningham, Los Angeles; F. H. Searight, Allis Chalmers, San Francisco; M. S. Barnes, G-E, San Francisco; G. E. Bishop, Coast Counties Gas & Electric Co., Santa Cruz; D. W. Nurse, The Okonite Co., San Francisco.

Code Committee

The numerous beneficial activities of the code and ordinance committee are being continued by the new members, who are:

B. C. Hill, City of Oakland, chairman; M. G. Sues, Leo J. Meyberg Co., Los Angeles, vice-chairman; M. K. Bliss, Board of Fire Underwriters of the Pacific, San Francisco; J. O. Dillingham, G-E, San Francisco; D. E. Harris, G-E Supply Co., San Francisco; R. L. Hayden, Coast Counties Gas & Electric Co., Santa Cruz; E. A. Long, P. G. & E., San Francisco; A. H. Meyer, Leo J. Meyberg, San Francisco; J. F. O'Donnell, Westinghouse, San Francisco; F. C. Scharr, Bryant Electric Co., San Francisco; B. M. Tassie, G-E, San Francisco; H. L. Evans, Nicholas Electric Co., Los Angeles; Art Veit, Los Angeles County; H. L. Harper, Graybar Electric Co., Los Angeles; C. L. Moore, Chicago Flexible Shaft Co., Los Angeles; H. V. Busby, Edison Co., Los Angeles; Clark Chamberlain, San Diego Bureau of Radio and Appliances; A. I. Benedict, San Diego

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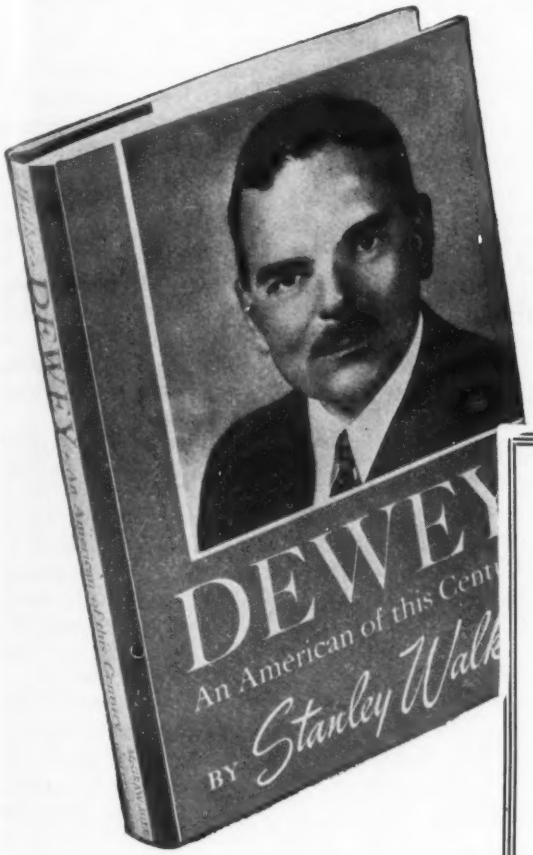

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   By Waldo G. Bowman, N. A. Bowers, Harold W. Richardson, Edward J. Cleary, and Archie N. Carter. Evewitness story of U. S. war construction operations in foreign lands. $2.75

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Gas & Electric Co.; W. S. Fleming, California Electric Power Co., Riverside; E. N. Frellson, G-E Supply Co., Los Angeles; D. C. Pence, Westinghouse Supply Co., Los Angeles.

At recent meetings held for northern and southern members, the necessity was emphasized for putting forth every effort for the further enactment of the Unsafe Appliance Ordinance without delay. Because of indicated early return to civilian production, appliances will be coming back on the market sooner than expected formerly.

To speed the early adoption of the ordinance by more cities, the list of those which have not yet adopted it has been divided among committee members. In each location, a local industry-wide committee is being organized in order to bring the urgency of the ordinance to the attention of electrical inspectors, local merchants, city councils and county supervisors.

At the committee meetings the policy was reaffirmed of working through electrical inspectors to secure the adoption of the appliance ordinance and the Uniform Electrical Code.

The question of changes in the Uniform Electrical Code was discussed, and it was decided that because the National Electrical Code is now in the process of revision, it would be untimely to change the Uniform Electrical Code until it is seen what new provisions are added to the 1945 revision of the National Code. The committee therefore is continuing its efforts on behalf of the current edition of the Uniform Electrical Code.

San Diego Bureau Elects

Indicating keen interest on the part of the entire organization in choosing the men to serve as its officers, the Bureau of Radio and Electrical Appliances of San Diego County has recently held a warmly contested election. The results were as follows:

William Powell, Coast Electric Co., president; Frank J. Guasti, Parmelee Dohrmann Co., first vice-president; Lou Wiese, Wiese's Ltd., second vice-president and Sam L. Hall, Electric Supplies Distributing Co., treasurer. Directors include Harry E. Callaway, Thearle Music Co.; A. K. Chamberlain, Refrigeration Equipment Co.; A. T. Davidson, Davidson Furniture Co.; Albert Dryer, Dryer's Standard Furniture Co.; Paul A. DuPont, Walkers; Glen Dutton, Dutton's Radio Store; Arthur Francis, Churchill & Cassou Ltd., Escondido; Harry Franz, Harrington's Appliances; Robert E. Harris, S. D. Standard Electric Corp.; Elmer B. Hazie, San Diego Auto Electric Co.; Jerry Heilbron, Heilbron Electrical Co.; E. W. Kinmore, Kinmore Electric Co., Chula Vista; E. W. Meise, San Diego Gas & Electric Co.; Ted Reser, Western Radio and Electric Co.; Ben Rogers, Firestone Stores; Elmer Small, H. L. Benbough Co.; Robert Swearengin, El Cajon Supply Co., El Cajon; O. G. Thompson, G. E. Supply Corp., and J. F. Zweiner, Zweiner Electrical Co.

Secretary-Manager J. Clark Chamberlain attended the annual conference of the International Association of Electrical Leagues in Detroit and made calls upon manufacturers in the East to learn of trends and to bring back what news there may be about resumption of appliance manufacture.

RMEL Victory Rally

With postwar and tax questions discussed by experts in their fields, Rocky Mountain Electric League staged a Pre-Victory rally in Denver on Oct. 1-2. President C. C. Baker presided at the conference, which included the league's annual meeting and election of officers.

According to the program schedule, Monday morning's session was to include a talk by Letcher Lusby, National Tax Equalization Assn., Chicago, entitled *Lost — A Billion in Taxes*; a discussion of the postwar trend in appliance selling by C. E. Greenwood, Edison Electric Institute, N. Y.; and *Changes in Public Utilities Positions* by Public Service of Colorado President J. E. Loiseau. In the afternoon, Harry Hall, president Klau-Van Pietersom-Dunlap, Milwaukee, was to speak on *Tax Slackers and Rip Van Winkles* and L. W. McLeod, Westinghouse central station division, St. Louis, on *The Postwar Power Market.*

Reports of the proceedings of the recent IAEL and IES meetings in Chicago were scheduled for Tuesday morning, with delegates from the area reporting. A lighting talk by H. Freeman Barnes, G-E lamp department, Cleveland, also was on the morning agenda. Tuesday afternoon, Kinsey M. Robinson, president Washington Water Power Co., Spokane, was to speak on *What of the Future.*

With enthusiasm the East Bay Electric Club began its fall meetings Sept. 11 under the chairmanship of Bob Will, T. L. Rosenberg Co., Oakland, as president, with M. C. Sandles, chief electrical inspector, Oakland, secretary-treasurer, and Henry Lenninger, Pacific Gas and Electric Co., vice-president and program chairman. Meetings are being held each Monday at Hotel Coit. The PG and E new Kodachrome moving picture *Hydro-Electric Industries* was shown at the Sept. 18 meeting.

Industry Meetings

Two regional industry meetings sponsored by Northwest Electric Light & Power Assn., are to be held in Albany, Oregon, Sept. 29, and in Portland, Oregon, Oct. 2. They are to be of the same type as the ones held in ten cities in Washington, Oregon and Idaho in June, drawing together appliance dealers and electrical contractors, manufacturers, jobbers and utility people.

The program conducted in one hour and a half following dinner, consists of a series of short talks and demonstrations bringing out postwar plans of manufacturers, jobbers and utilities, and giving an inkling of what may be expected in the way of new lighting and appliances to appear on the market after the war.

The manufacturer and jobber plans will be discussed by S. S. Brundage, General Electric Supply Corp., Portland, while Walter E. Potter, Lamp Dept., General Electric Co., and H. L. Bargion, Lamp Div., Westinghouse Electric & Mfg. Co., also of Portland, will conduct demonstrations and discuss new lighting sources and the trends of lighting developments. R. C. Kenney, Portland contractor, will present the National Adequate Wiring promotion story. The utilities will be represented on the program in Albany by Z. E. Merrill, president, Mountain States Power Co., and in Portland by J. H. Polhemus, president, Portland General Electric Co. and T. E. Roach, vice-president and general manager, Northwestern Electric Co. Dr. George W. Allison, formerly of the Edison Electric Institute, now with Puget Sound Power & Light Co. in Seattle, will wind up both programs with an inspirational talk on *"When the Shooting is Over."* Berkeley Snow, secretary of the association will act as chairman of the meetings.

The Albany meeting will draw attendance of appliance dealers and electrical contractors from Willamette Valley towns in Oregon. The Portland meeting will cover the territories served by the two Portland utility companies drawing attendance from Woodland, Washington, in the north, to Salem, Oregon, in the south and from all communities adjacent to Portland. An attendance of 500 or more is expected at Portland.

L. T. Rader, electrical research engineer in the Industrial Control Engineering Division of General Electric Co., spoke on *Arc Interruption With Particular Reference to Aircraft* at the Sept. 5 meeting of the American Institute of Electrical Engineers, Vancouver Section, Vancouver, B.C. Dr. Rader stopped at Vancouver on his return from the Los Angeles meeting of AIEE.

The Economic Reconstruction of Europe

THE time is fast approaching when allied and enemy populations alike will demand a blueprint for the economic reconstruction of Europe. The peace plans following this World War will be written piecemeal, and by experts, at a series of continuing conferences, such as Hot Springs, Bretton Woods, Dumbarton Oaks and Quebec, each tracing a new pattern for negotiation and each dealing with a single, specific problem. In the drawing of these plans, the United States, as owner of more than half of the world's industrial capacity, controller of the only great credit reservoir, and possessor of the largest force of highly skilled technicians and management engineers, has heavy responsibilities which its industrial, financial, agricultural and labor leaders cannot evade.

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Just what is the problem which the world's business leaders must help solve in Europe?

The best safeguard of peace is economic opportunity — a good chance for all peoples to raise their standard of living by their own ingenuity, foresight and industry.

Frustrated and disappointed peoples, who view the future with misgiving rather than hope, breed fanatical demagogues who seek to divert nations from their ills and disappointments by promising military glory and conquests.

Consequently, an important step in building a secure and lasting peace is to open the doors of opportunity to the peoples of Europe.

The greatest obstacle to opportunity in Europe has been economic nationalism.

The economic tradition of the Continent always has been highly nationalistic. The national feeling generated by the first World War, and the political autonomy conferred upon many peoples by the peace treaties, led to a great growth of economic restrictions. This trend was accentuated by the depression and by the military plans of the Fascists and Nazis. Hitler had to show his people they could be fed even if a blockade was imposed again. The inevitable result of these influences was to carry self-sufficiency to tragic extremes.

Economic nationalism holds down the standard of living of Europe in two ways:

1. It prevents the rise in most European countries of low-cost mass production.
2. It operates against an efficient geographical division of labor, preventing nations from doing what each can do best.

Great machines require great markets. One great machine of which the United States has many and Europe few is the continuous strip steel mill. At the outbreak of the war we had twenty-eight such mills of various sizes, England but one, and Continental Europe one. A building containing one of these machines is more than a quarter of a mile long and the minimum cost of the mill is almost $25,000,000. Only the prospect of a mass market justifies production on this vast, but highly economic basis.

The wasteful geographical distribution of production is shown by the agricultural policies of Italy, France and Germany.

In the 1930's, when lard sold for less than 8¢ a lb. in the United States, it cost 32¢ a lb. in Germany. In Italy and Germany imports of wheat were banned and its production at home was heavily subsidized. By the middle of the 1930's, wheat sold for $1.55 a bushel in France, $1.97 in Czechoslovakia, $2.29 in Germany, and $2.47 in Italy. At the same time the United States and the other efficient world producers and exporters (Canada, Australia and Argentina) were *restricting* production and were unable to average more than about 75¢ a bushel for their wheat.

Economic unity in Europe must ultimately mean a freedom to trade not greatly different from what we have within the United States. Given economic unity and the large markets which go with it, efficient mass production will develop. With Europe receiving cheap supplies of such staple foods as wheat, pork, lard and dried fruits from overseas, European farmers can prosper by specializing in producing fresh foods — butter, cheese, eggs, fruits, vegetables.

Then European agriculture will be more prosperous producing its specialties, and our agriculture (and that of the other great efficient surplus-producing countries as well) will have greatly expanded markets for our staples.

With a cheaper food supply for Europe — yet one yielding a better price for our agriculture — European labor will live better. Labor now used uneconomically for agricultural production will be released for industry. With big machines and semi-automatic processes European labor can produce more steel, automobiles, furnaces, plumbing and electrical appliances to advance its standard of living in coming decades, as the United States has done in past decades.

A rising standard of living in Europe will bring

Europeans to view peace with optimism and hope. And world trade grows as confidence and prosperity widen.

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How would a Europe which possesses economic unity appear to us on this side of the Atlantic?

It would be a prosperous Europe that would have strength in its advancing industries, but as the single great agricultural deficit area of the world, it would be dependent upon overseas supplies for vital agricultural staples. This dependence upon overseas agricultural supplies would be greatest for industrial Germany. Some people believe that a strong Europe would be a threat to world peace. More important, however, is the fact that a strong and prosperous Europe would not be a frustrated Europe. It would have found a way to achieve a rising standard of living. Furthermore, a prosperous Europe would, economically, be a dependent Europe because, although the European industrial worker would use more and cheaper food, he would have it only as long as he maintained the peace.

A prosperous Europe would be of special advantage to American agriculture (if we do not keep on pricing ourselves out of the market) and of great advantage to American industry.

The British policy of buying agricultural staples from abroad, for example, made her, a nation of only 45,000,000, the purchaser, in 1937, of $250,000,000 of all kinds of agricultural products from the United States. In the same year the rest of Europe (exclusive of Russia), with a population of 325,000,000 purchased only $300,000,000 of our agricultural products. But with more sensible organization of its agriculture, Europe could be expected to buy more than one billion dollars of agricultural products from us.

By far the greatest market for an expanded European industry will be Europe itself.

For American industry, there will be growing markets in Europe as industry expands. Experience shows that the trade between different highly industrialized areas is large. This country's biggest export markets have been with its keenest competitors — Britain, Canada, Japan, France and Germany.

Before the war, Europe, with two and one-half times the population of the United States, had only one-sixth as many automobiles.

If Europe (exclusive of Britain and Russia) were to motorize proportionately, it would need 75,000,000 automobiles. With normal depreciation this would ultimately mean 10,000,000 cars to be produced annually to replace worn out cars.

If one still wonders about the immense number of things Europe might produce *for herself*, let him calculate the highway expenditures, the filling and repair station businesses that must be equipped and maintained; and the doubling of the steel production that would be required to make the automobiles themselves and to reinforce with steel even a moderate amount of additional concrete highways.

Another example is the electrification of Europe. With two and one-half times our population Europe's consumption of electrical energy would be 175 million electrical H.P., if the European worker were to have the advantage of as many H.P. as the American. Yet, just prior to the war, Europe's installed operating capacity was only about 40 per cent of this figure.

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What has been sketched for Europe is actually much more nearly a page from the economic history of the United States than it is mere prophecy about a desirable future for a Europe at peace. But how can it be achieved? And what is our part to be in helping to bring it about?

Economic unity can be provided for the sovereign states of Western Europe by the peace treaty or treaties adopted at the end of the war. The provisions for securing *economic unity* in Europe should specifically cover:

1. Substantial freedom for persons and enterprises to do business anywhere in Europe.
2. Reasonably free movement throughout Europe of persons for employment, recreation and education.
3. Greatly increased freedom of trade:
   a. Within Europe — through the application of a Europe-wide agreement reducing the tariffs among all European countries to a maximum of 10 or 15 per cent.
   b. With the rest of the world — through reduction of European tariffs on goods bought from overseas. This would call for generally lower levels on manufactured goods, and for the removal (after a reasonable period of progressive reduction) of tariffs on all agricultural foodstuffs and most industrial raw materials.
4. A special currency provision requiring as nearly as practicable complete currency stabilization for all countries of Western Europe among each other.
5. Creation of an agency (with adequate revenues) through which all Europe-wide business and other affairs affected by these agreements would be administered for a minimum period of twenty-five years.

This would permit the economic unity of Europe to be substantially achieved. During this period, assistance in administering the provisions would be given by officials of the United Nations.

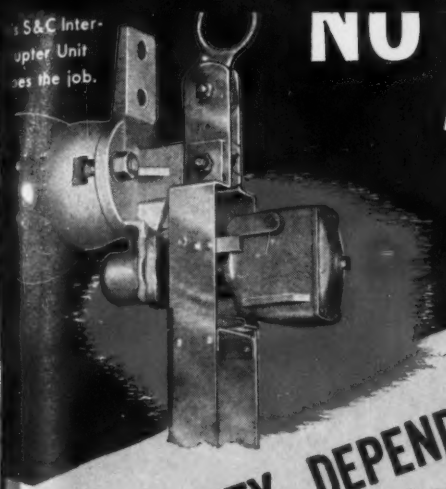
Near the end of such a period arrangements could be made for a vote in the European countries on whether or not to continue the "unification provisions." If the vote were in the negative, the United Nations would have proper warning that additional safeguards would be necessary to prevent war.

The suggestions made in this statement aim at securing economic unification of Europe and thereby promoting the possibilities of permanent peace in Europe.

The realization of these possibilities throughout the postwar years requires a freely expressed public opinion in Europe to guide all who share the responsibility for bringing peace to Europe and to the world.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.



s S&C Inter-
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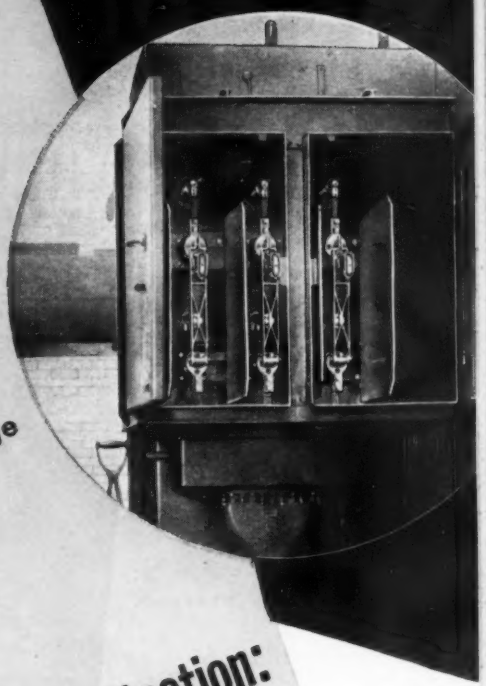
NO ARCING
AT MAIN SWITCH CONTACTS



SAFETY, DEPENDABILITY, ECONOMY
For performing these load switching operations:

(a) on substation installations,
(b) for line and feeder sectionalizing,
(c) for interrupting magnetizing current of large transformer banks,
(d) for by-passing and isolating feeder voltage regulators,
(e) for disconnecting capacitor banks.

Add SIMPLIFIED short circuit protection:

(1) At System Feeder Substations
(2) Customers' Services
(3) At System Feeder Tap Locations
(4) For Switching and Bus Protection on Large Industrial Systems
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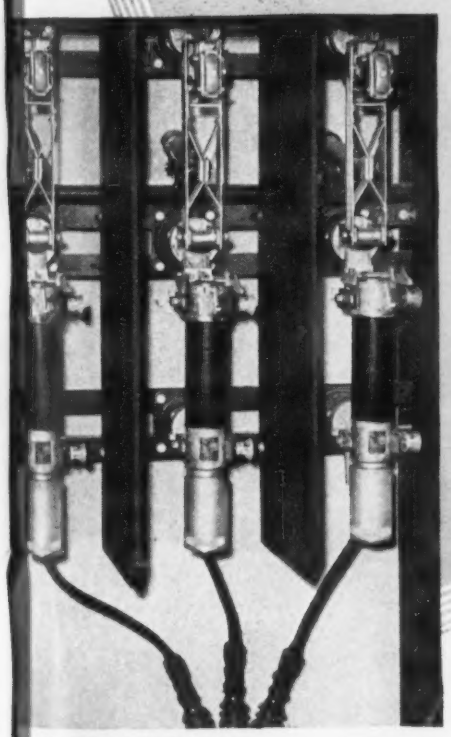

CABINET-ENCLOSED LOAD-INTERRUPTER AND FUSE COMBINATION, 7500 volt, 400 ampere, 3-pole, gang-operated, in trancell housing, and with remote control handle. For indoor service on power center control. Operating at 4160 volts, it provides load switching and short circuit protection of maximum 400 ampere current.

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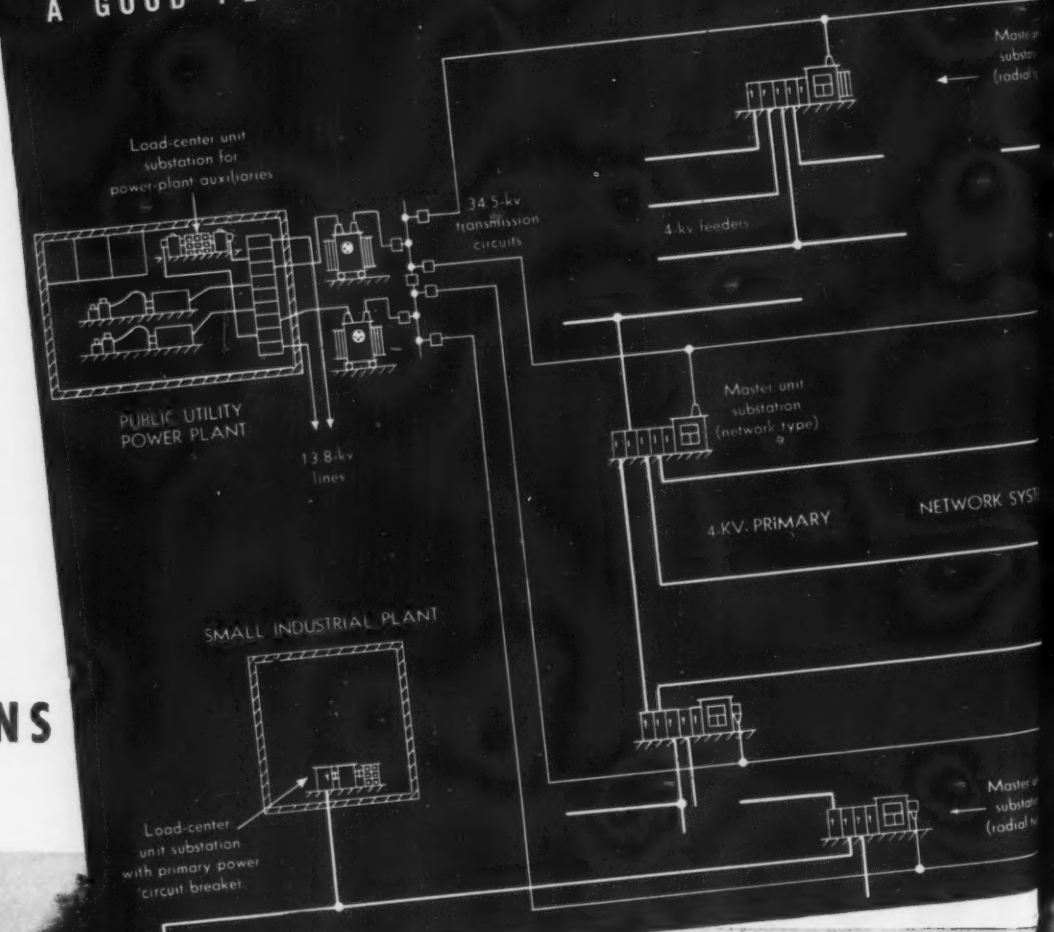
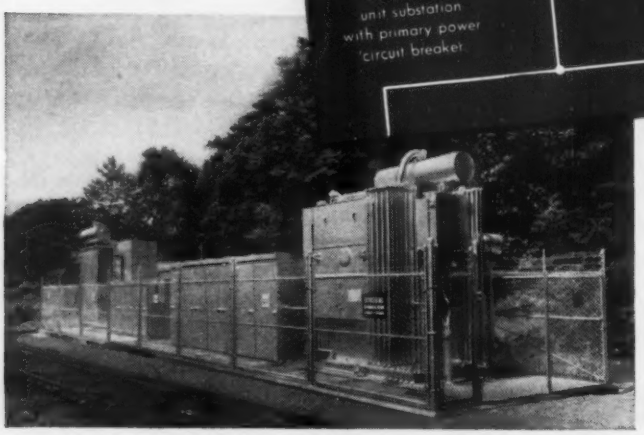
TO MAKE YOUR OVER-ALL SYSTEM PLANNING

Standard unit substations eliminate

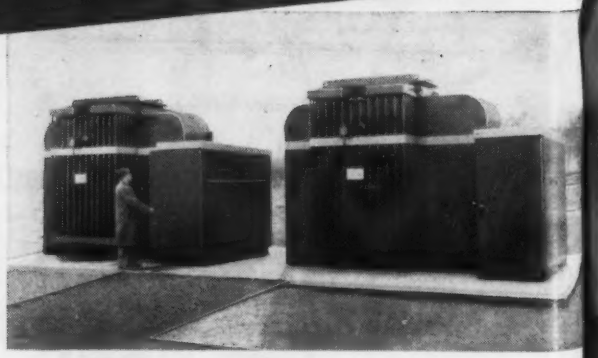
A GOOD PLAN + G-E UNIT SUBSTATIONS = BETTER



UNIT SUBSTATIONS

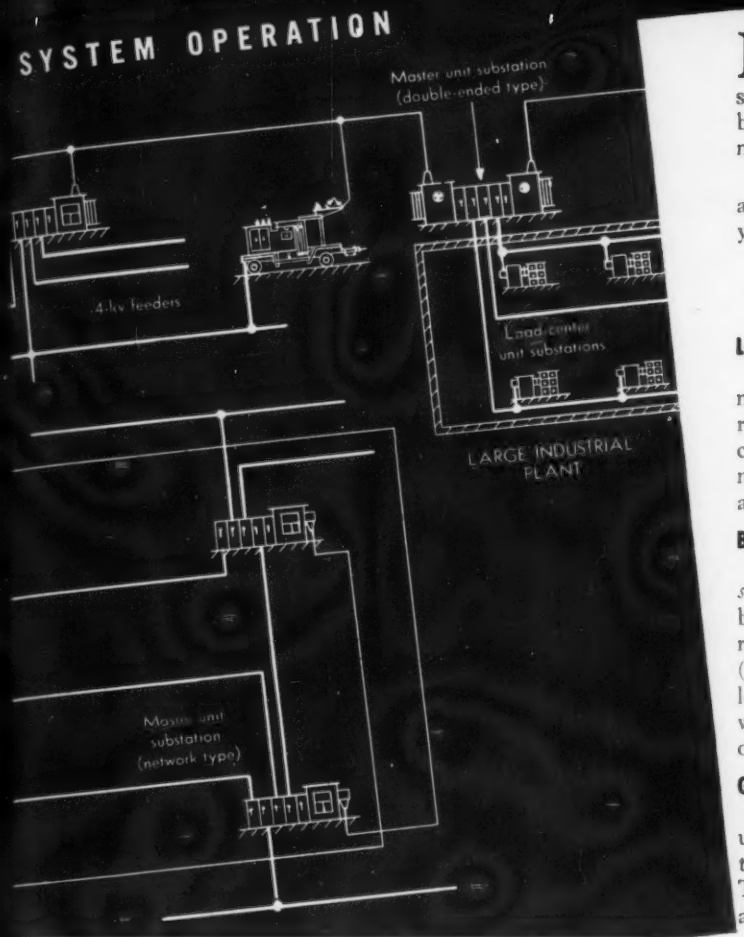


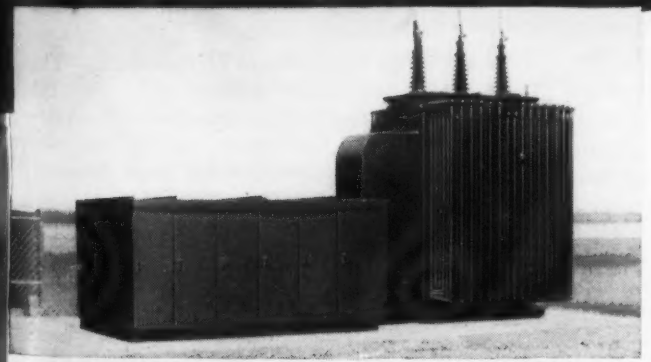
A flexible arrangement which allows breaker units to be added as the load grows—without disturbing existing equipment. If the load shifts, these substations can be moved easily to the new load centers.



Two master unit substations installed in one location to provide duplicate transformers and subtransmission feeds for the feeder bus.

EASIER . . .
many worries about equipment details





Catalog numbers make the ordering of unit substations easy. Hundreds of *complete substations* are now listed by catalog number.

MANY operating companies have found that by using repetitive-manufacture* unit substations in their systems, instead of building equipment piecemeal, they have been able to devote time thus saved to the more important matter of over-all-system engineering.

This approach to system improvement, together with the advantages afforded by co-ordinated unit substations, enables you more easily to:

1. Reduce capital investment
2. Provide better continuity of service
3. Insure greater flexibility of the system

Lower Capital Investment

Standard unit substations make it possible for you to modernize or expand your system economically. You can reduce your capital investments when additional substation capacity is needed by adding that capacity in smaller increments. This procedure keeps your investment closer to your actual load-growth curve.

Better System Operation

A well-planned system, one which has *completely automatic*, *standard* unit substations, means fewer customer outages, better voltage conditions, and a lower equipment-failure rate. The dispersal provided by a number of smaller units (see diagram), compared with one large, central substation, localizes troubles and prevents huge equipment losses as well as large-area outages resulting from fires, explosions, or other misfortune.

Greater Flexibility

Shifting loads are easy to follow because these standardized units are relatively easy to move. *Increasing* loads are easy to handle by purchasing additional units as they are needed. This precludes the possibility of installing a large substation and waiting for a load which may never develop.

Lower Overhead

G-E *unit substations* are shipped directly to the installation site in completely assembled sections. You save the time and expense of passing hundreds of parts through stockroom or warehouse. You avoid the confusion of lost, delayed, or forgotten or duplicated parts, rush orders, and consequent rehandling. Installation is always much easier and faster than it is with a piecemeal-built substation, and there can be a more efficient use of man power. Crews quickly become familiar with them because there are only two or three pieces to handle.

Ask your G-E representative for Bulletin GEA-3800, or for a detailed presentation of our complete line in the light of your specific problem. General Electric Co., Schenectady 5, N. Y.

*G-E unit substations are now being built repetitively from standard components for almost any application you may have.

GENERAL ELECTRIC

302-21-5900

NEWS of the industry

COMMITTEE STUDYING COLORADO PROJECTS

A committee to study projects on the lower Colorado River has been appointed by the Utah Water Users' Assn., which recently completed permanent organization. The committee will make its survey in the light of the proposed treaty with Mexico, under which that country would receive 1,500,000 acre-ft. of Colorado River water a year.

Inquiry into the reasons for California's vigorous opposition to the treaty was suggested by William R. Wallace, Salt Lake City, former chairman of the Utah Water Storage Commission and president of the Water Users' Assn. Wallace contended that the treaty, now pending before the Senate foreign relations committee, is a good treaty and can be ratified without harm to the state of Utah.

Members of the committee to make the study are Wallace Mathis, St. George, Horace Allred, Duchesne and Byron Howard, Huntington, directors from the Colorado basin in Utah.

State Operation of CVP Held Feasible Under Law

Federal and California state laws would not prohibit state operation of the Central Valley Project, according to Edward Hyatt, state engineer, who was appointed by the California Water Project Authority recently to study feasibility of such a move. (E. WEST, August 1944). The Interior Department has power to turn over operation to the state, which has the authority to operate and maintain the project, Hyatt said. Actual transfer, however, could be effected only through act of Congress.

Although previous legislation empowers the project authority to proceed with negotiations, members of the authority indicated they would make no move to gain control of the CVP without a further legislative mandate. No repayment contract would be practicable, the report declared, until actual cost of the project, on which $160,000,000 already has been spent, has been determined.

Hyatt noted in his report that state negotiations for repayment of project costs had been turned down by a former reclamation commissioner on the grounds the state authority lacked power to tax as required by federal reclamation law.

However, since the authority can force local districts, which would receive eventually CVP power and water, to levy taxes, it can claim indirect power to tax, Hyatt said.

The authority probably could operate and maintain the CVP without issuance of bonds, in Hyatt's opinion, through water and power contract revenue.

PUD Proposition Refused Place on November Ballot

A move to place on the Nov. 7 election ballot a proposition to create a PUD in Spokane County, Wash., failed Sept. 22, when the Board of County Commissioners upheld County Auditor Joe A. Stewart in his refusal to submit the issue to a vote.

Stewart had refused to certify the proposition for the election ballot because the petitions submitted to him by the deadline of Sept. 20 lacked by 324 the required 4,928 valid signatures.

Leaders in the PUD movement asked the county commissioners to adopt a resolution overriding the action of the county auditor, admonishing them that it would be "good politics" for them to "give the public a break". The commissioners voted unanimously against adoption of the proposed resolution, with one of their members remarking that "we are not interested in whether the matter is good politics, but only if it is good business".

Court Denies Vote on Compact Ratification

Appeal to force a referendum vote at the November election on Arizona's ratification of the Colorado River Compact was dismissed last month by the State Supreme Court. In turning down the appeal brought by Sidney Kartus, head of the Verde-Glen-Bridge Canyon Highline Assn., and Joe Conway, state attorney general, Judge A. G. McAlister declared the matter a moot question, since the contract had been approved by the governor and ratified by the state legislature. Under the contract, Arizona will receive 2,800,000 acre-ft. of water annually from Lake Mead storage plus half the river surplus.

FORT PECK POWER SALE PROVIDED IN BILL

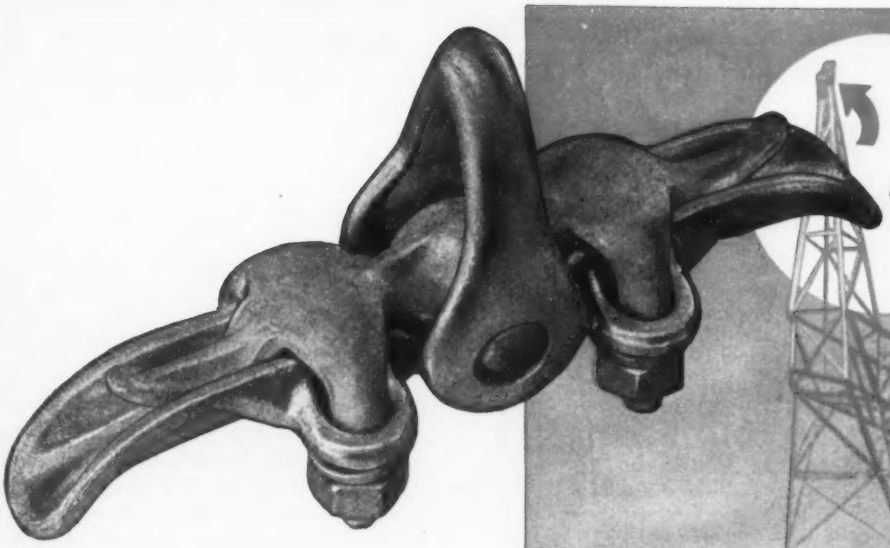
Direct sale to consumers by the federal government of power generated at Montana's Fort Peck project was provided in a Congressional bill introduced last month by Sen. William Langer, North Dakota Republican.

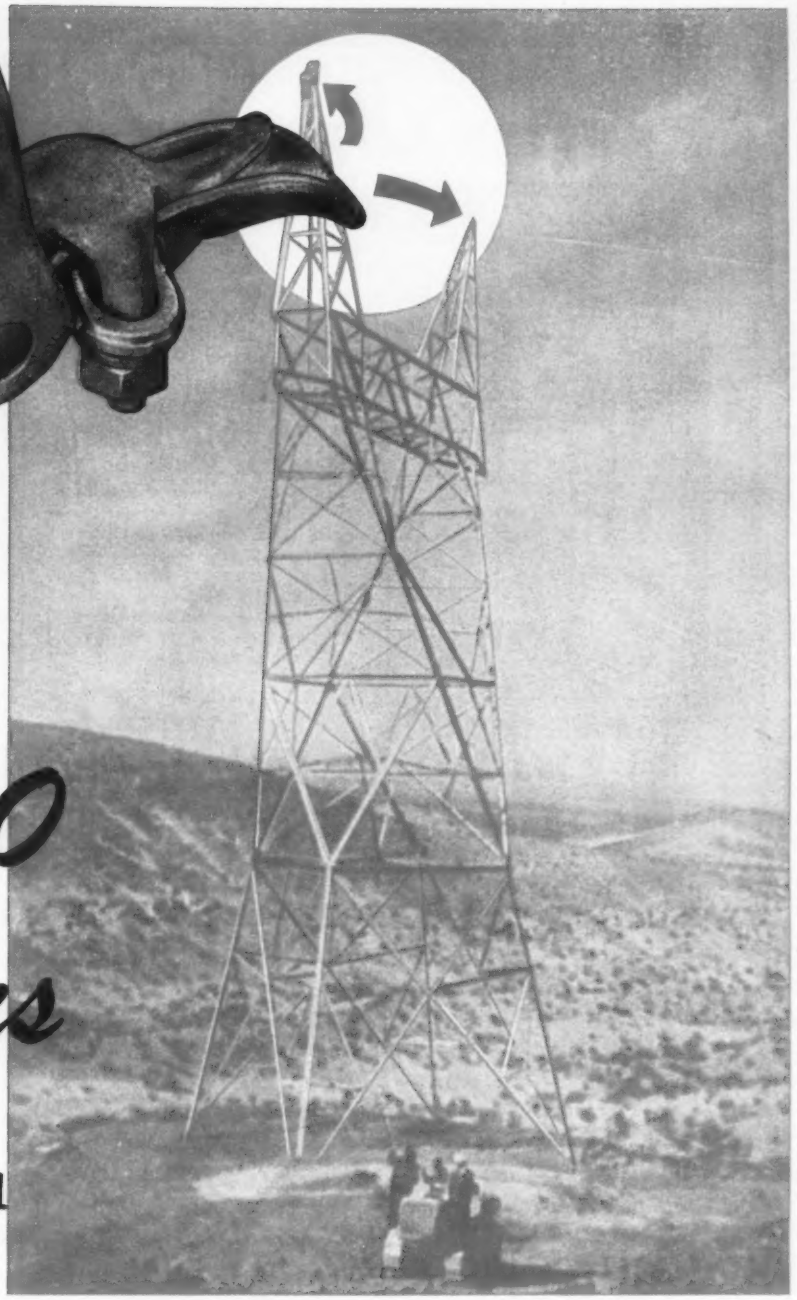
Fort Peck, with one 35,000-kw. hydro unit, generates about 200,000,000 kwh. yearly, most of which is now sold to the Montana Power Co. under a duration contract. After the war, Interior's Power Division, which is charged under the Fort Peck Act with disposition of the energy, hopes to market it, as directed by the act, with preference to public bodies and cooperatives. It is hoped that the present irrigation pumping load will be expanded after the war to take a much larger part of the Fort Peck output.

Under Langer's bill, a Missouri Valley Power Administration would be organized, headed by a $10,000 a year administrator, who would get all the energy not required to operate the project. He would be directed to dispose of it "by sale to consumers, either directly or through cooperative associations, at the lowest possible rates consistent with sound business principles, the rate schedules to become effective upon . . . approval by the Federal Power Commission." He would be required to give preference to "consumers in rural areas who are not receiving central station service," and would be empowered to construct and acquire transmission lines and other facilities necessary to serve such consumers "in as wide an area as can be efficiently served."

The act provides further that: "The Administrator shall provide for the furnishing and installation of equipment and appliances to, and the wiring of the premises of, such consumers, at cost upon such terms as may be necessary to provide all such consumers a reasonable opportunity to purchase and utilize such electric power."

Langer told the Senate he favored the principle of the Missouri Valley Authority bill introduced recently by Sen. James E. Murray, Montana Democrat, but added that he hoped to see Fort Peck power put to work for farmers of the region as soon as possible. An identical Missouri Valley Authority bill has been introduced by Rep. John J. Cochran, Missouri democrat.





The 8200 Series

For all generally used ground wire cables.

This drop forged trunnion type ground wire suspension clamp combines strength and adequate cable-supporting length with lightness and smooth contact surface. The integrally forged U-Bolt Keeper on which the supporting bail is factory assembled results in a minimum of loose parts and simplicity of field application.

Why not get the full story on BTC clamps. Your copy of our Hi-Line reference book on request.

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In the electrical wiring of factories, homes, public buildings, etc., leading electrical contractors are using millions of IDEAL "Wire-nuts" because they make wire joints that are neater, safer, quicker, better electrically—stronger mechanically. IMMEDIATELY AVAILABLE . . because no critical material used. Approved by Underwriters' Laboratories, Inc.

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NEW RULES TO GOVERN PG AND E EXTENSIONS

Pacific Gas and Electric Co. application for liberalization of rural line extension rules was granted last month by the California Railroad Commission. The new rules, which are effective as of Sept. 23, will make possible electrification of additional rural areas of northern and central California, according to the utility.

California for many years has been a leader in percentage of farms receiving electric service. Officials of PG and E said the action of the commission will enable the company to provide services without increase in the existing rates to scattered and more remote rural areas which hitherto have been without electric service.

The utility already has on file plans for 839 extensions involving 1,696 miles of line which will serve 5,452 new customers. Investments incident to construction of the new lines will approximate $4,000,000.

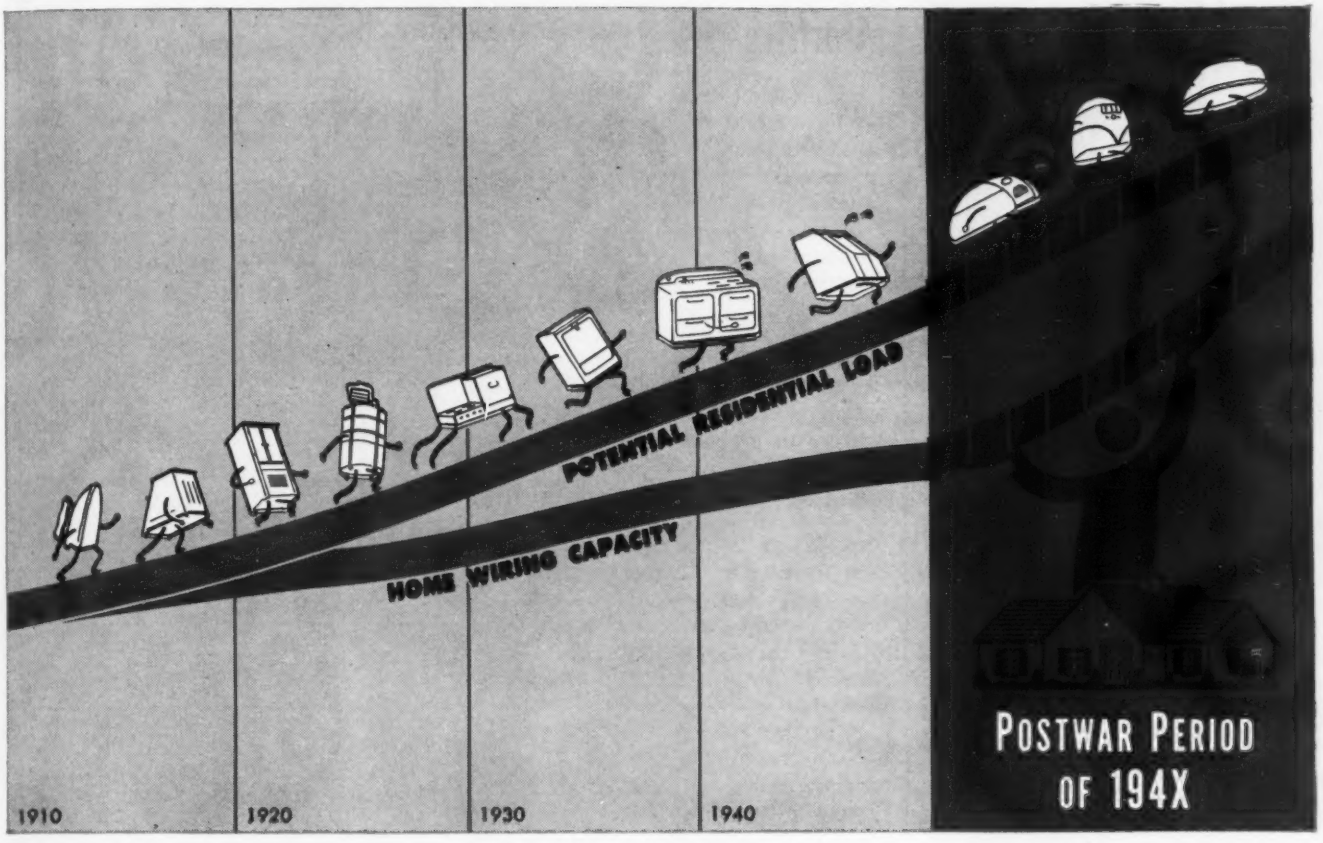
The PG and E application before the Railroad Commission was opposed by the Redwood Electric Cooperative and the Foothill Electric Assn. but their protests were dismissed. In granting the application the commission commented, "The record shows that, while each of the cooperatives is said to have secured financial allotments for the construction of distribution facilities through the Rural Electric Administration, yet neither one has any plant or electric lines, and no electric service is rendered to any one."

Former line extension rules required prospective rural customers to advance part of the cost of building the extension at the rate of 25 cents per foot, when the distance was in excess of specified footage paid for by the company. Under the amended rules, the free footage allowance is doubled, giving the customer twice the length of extension before he is required to pay anything. PG and E also agreed that, until January 1946, it will waive any payment by the customer where the cost of the extension does not exceed a sum 15 times the expected annual revenue to be derived from the new line. Amounts advanced for line extension are refunded to the customer over a period of years.

The utility further stipulated that it will bear any deficiency in revenues between the "doubled" rule and the proposed new "15 to 1" rule that might occur under operation.

In granting the application, the commission declared it part of a comprehensive program of war and postwar planning to extend electric service.

★ BETTER WIRING FOR BETTER LIVING ★



Home wiring capacity needs a LIFT!

IF anticipated residential loads are to be doubled within 5 years after Victory, home wiring standards *must* be raised to meet future load demands—created by the increased number and wattage of home electrical equipment.

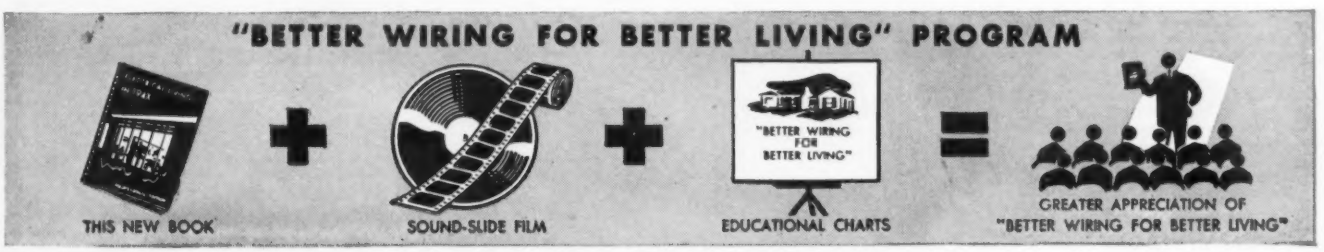
This applies equally to *existing*, as well as *future* homes built after the war.

Today, 95% of America's homes are inadequately wired. This creates a serious bottle-neck to utility load-building programs.

To help utilities break this bottle-neck, we have developed the "Better Wiring for Better Living" Program—with educational material consisting of a new book, "Electrical Living in 194X" . . . a sound-slide film . . . and meeting charts.

Your representatives will find this material especially helpful in selling the need for *better wiring*—to architects, builders, engineers, contractors, wiremen, and others interested in building—and to present and prospective home owners.

For complete information regarding the "Better Wiring for Better Living" Program, communicate with your Westinghouse District Office or write: Better Homes Department (EP-104), Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.


"BETTER WIRING FOR BETTER LIVING" PROGRAM
THIS NEW BOOK
SOUND-SLIDE FILM
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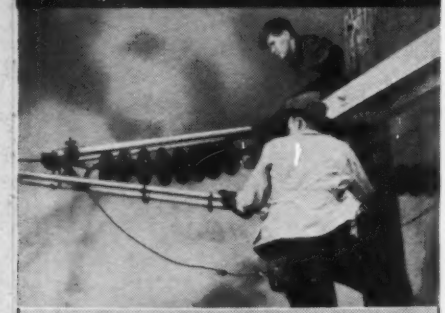
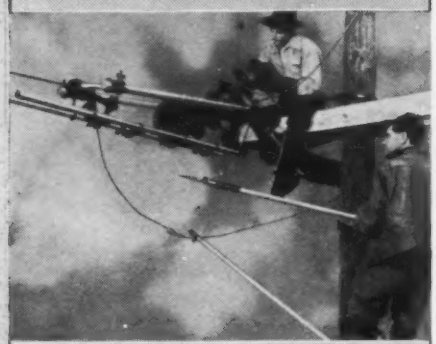
TUNE IN: John Charles Thomas, *Sunday 2:30, EWT, NBC.* Ted Malone, *Monday, Wednesday, Friday 10:15 pm, EWT, Blue Network.*

New "cradle" device simplifies dead-end insulator changes



Here the strain carrier has been applied and the lineman on the pole is placing the cradle in position under the insulators. Strain will be released with a ratchet wrench on the strain carrier.



After strain has been released from the insulators, the lineman on the pole releases the cotter key with a key puller and insulators are pulled in on the cradle for making changes.

A safer, easier job with TIPS TOOLS

Changing dead end insulators on high voltage lines without interrupting service is an operation that usually requires less than an hour's time with the use of Tips Tools. Linemen work in complete safety and by using the new Tips suspension cradle for carrying the weight of released insulators, the job is greatly simplified.

The above photos show an insulator change being performed on a 110 KV line. The new cradle is hung under the strain carrier and released insulators may be pulled in over the cradle for changing defective units. Note that the jumper is held at a safe distance by a Wire Tong. By this improved method, dead end insulators on crossarms or corner poles can be changed in the same amount of time that would be required to do the job cold, thus the time required for obtaining clearances, switching, etc., can be saved.

The big factor, of course, is the prevention of outages. Cut the risk of long service interruptions by outfitting Maintenance crews with Tips Tools for quick, safe repairs while the power is on. Get the details from our catalog or write for specific information.

CONSULT YOUR TIPS TOOL CATALOG

A·B·CHANCE CO. CENTRALIA MISSOURI

FPC GIVES DECISION IN UTILITY CASE

Elimination from Washington Water Power Co. electric plant accounts of approximately $7,000,000 said to represent excess over original cost was ordered last month by the Federal Power Commission and the State Department of Public Service. The orders follow hearings on company accounting practices instituted in 1939 under the FPC uniform system of accounts.

The FPC order calls for disposal within a 15-year period by annual charges to miscellaneous amortization of $3,319,549, representing excess of acquisition cost over original cost of acquired property; and immediate disposal of $3,633,338, representing debt discount and expense in connection with the sale and issuance of bonds, excess over cost of property acquired through an affiliate and other items. Ordered to be retained in electric plant adjustment accounts pending further order are amounts of $36,000 representing profit on engineering and other fees paid to the Phoenix Utility Co., an affiliate, and $49,250 representing profits on fees paid to Electric Bond & Share.

New Plan Filed for Pepco Reorganization

Dissolution of Portland Electric Power Co. and two subsidiaries and creation of a new company to be known as the Realization Corp. to liquidate assets and distribute proceeds was proposed in an amended reorganization plan filed with SEC by Guaranty Trust Co. of New York. Four reorganization plans were rejected by the commission last June and only Guaranty Trust Co. of New York took advantage of the 60-day period for revision.

According to the amended plan, common stock of Portland General Electric Co., a subsidiary, would be increased from 500,000 to 1,500,000 shares and the number of outstanding from 236,819 to 1,015,299 shares, without changing the capital stock liability. Authorized common stock of Portland Traction Co., another subsidiary, would be increased from 150,000 to 750,000 shares and the outstanding number from 31,131 to 576,834. Cazadero Real Estate Co. and Little White Salmon Land Corp., subsidiaries, would be dissolved.

According to a recent report of the Pepco Independent Trustees, earnings for 1944 have been at a satisfactory level with respect to Portland General Electric and the Interurban Railway, while Portland Traction Co. earnings are at an abnormally high level due to wartime conditions.

The report stated that rough calculations would indicate that market value of the company's securities has increased more than $30,000,000, or approximately 100%, over the low market quotations existing since inception of the bankruptcy proceedings in April 1939.

Electriquiz Answers

(See Page 96)

1. Ultimately 100%. From the lamp itself approximately 90% is given off as heat and 10% as radiant light energy. When the light rays strike an absorbing body, they again are absorbed as heat.

2. (a) Heating and ventilating experts agree on approximately 400 Btu's per hour.* (b) Approximately 117 watts.

3. From many studies, engineers have discovered that the average worker can maintain a power output of 35 watts. Thus in a 10-hour day one produces only 1/3 of a kilowatt-hour. No man has ever been found who could produce 2,665,200 foot-pounds (1 kilowatt-hour) in a given continuous 12-hour working day.

4. The amounts are the same—each is about 651 million dollars.

*Excluding glamor girls and stuff.

● CONDEMNATION suit of the Lincoln County PUD against Washington Water Power Co. was dismissed late in September by Superior Court Judge W. M. Nevins. The order was the result of a stipulation by attorneys for both parties. The suit had been pending since December 1939, when four counties—Lincoln, Okonogan, Douglas, Grant — filed condemnation proceedings against the utility.

The Okonogan-Douglas case resulted in a jury valuation verdict of $2,366,696, as compared with approximately $1,055,000 set by the PUDs.

● A LANDSLIDE on the foothills northeast of Ogden damaged Utah Power & Light Co.'s Pioneer plant recently, blacking out circuits carrying power into the city. The slide, which deprived thousands of acres from irrigation water, occurred when a canal gave way, probably from seepage above. Temporary repairs restored power service in less than one hour.

CHECK the FACTS on SERVICE IMPROVEMENT

1. Air switches, operated automatically, can perform many operations desirable for service continuity. They can be applied to a variety of switching schemes including many methods of automatic transfer, or automatic sectionalizing. They may be controlled, through relays, on any predetermined condition of current, voltage or frequency.

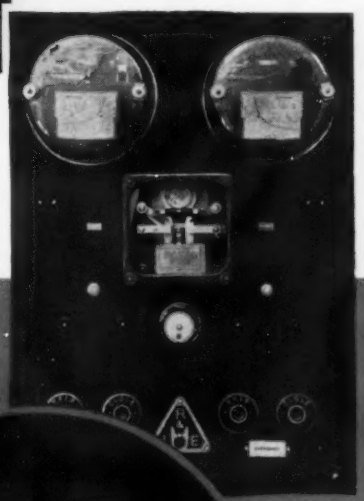
2. R&IE standard equipment—air switches, motor or spring mechanisms—has many distinct advantages for reliable operation. For instance, R&IE switches do not require slamming to close, and thus are especially suited for motor or spring operation.

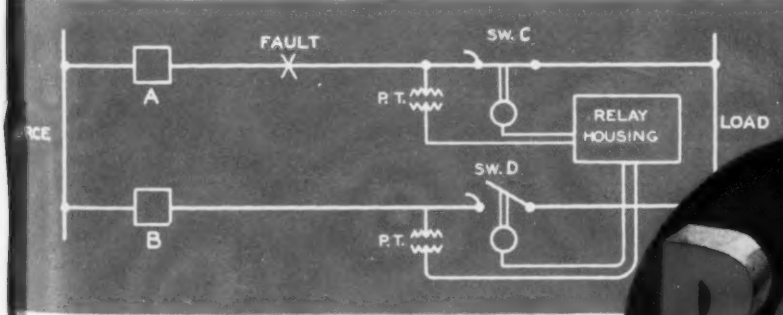
3. R&IE has complete facilities for the design and manufacture of control panels, switch mechanisms and complete mounting structures.

Typical control panel for automatic transfer installation.

Here is an automatic transfer installation which has been in operation for several years.

Below is shown a typical schematic arrangement of two air-switches for the transfer of a load from a faulty feeder to an emergency line. (1) Fault (at X) occurs, and (2) OCB (A) trips open, recloses, trips again. Switch (C) trips open from undervoltage. Switch (D) closes, restoring service. The load may be arranged to automatically return to first feeder without service interruption.





Consult your R&IE representative with your automatic switching problems.

R&IE

Automatic AIR SWITCHING EQUIPMENT

GARLAND-AFFOLTER ENGINEERING CORP.

The Check L

CONDUCTOR SUPP
CLAMPS AND FIT

DISCONNECTING SW
INDOOR AND OUTD

AIR BREAK SWI

INTERRUPTER SW

CUTOUTS A
THERMO-RUPT

SWITCH OPERA
MECHANISM

SUBSTATION

OPEN OR ENCL
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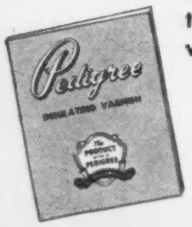

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Electrical Porcelain

COLLECTIVE BARGAINING ASKED OF BONNEVILLE

Changes in the Bonneville Act, which would enable the Bonneville Power Administration to enter into collective bargaining agreements with labor probably will be sought by the Interior Department.

The matter was brought to public attention recently, when the Columbia Power Trades Council, a group of labor unions, passed resolutions complaining of existing conditions. They charged that recent Bonneville contracts were not the result of collective bargaining, that construction is being done by maintenance employees and that employees do not receive social security or unemployment compensation.

In a statement to the press, Bonneville Administrator Paul Raver stated that the present situation is brought about by limitations which the Bonneville Administration has been trying to overcome during its entire existence, and that a few simple constructive changes in the act enabling collective bargaining agreements had been prepared and recommended.

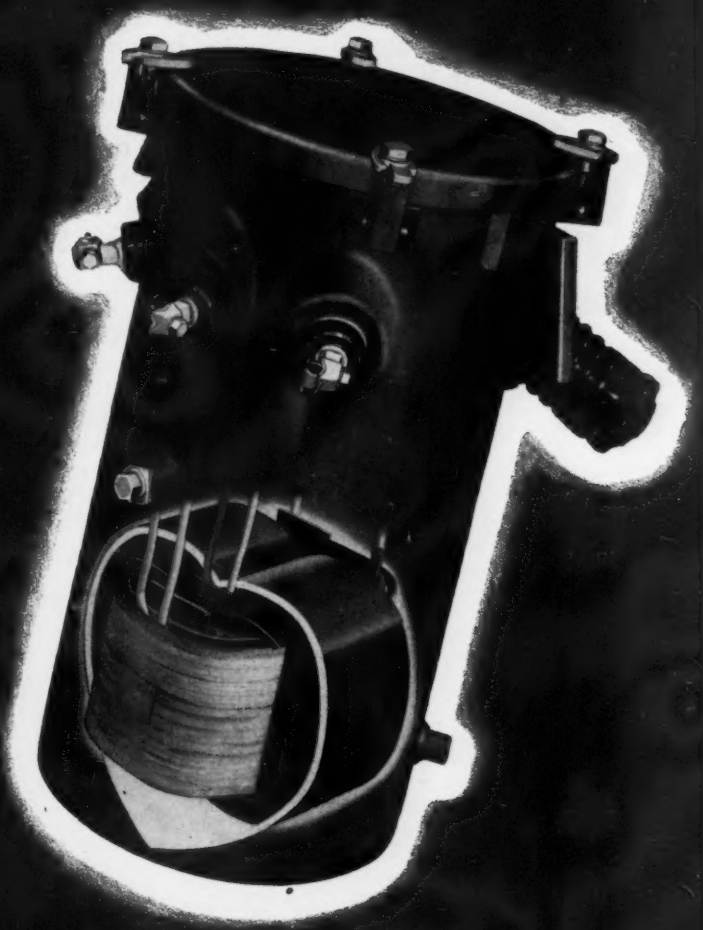
It was indicated in Washington that legislation similar to that under which TVA can deal with its employees and with labor organizations will be sought, but considerable question remains as to the scope of other legislation, under which Bonneville employees would be eligible for social security and unemployment compensation. Since failure to receive social security affects numerous other government agencies, there is question as to whether legislation affecting only Bonneville Administration employees would be introduced.

● A TAXPAYERS' SUIT, involving Pacific Gas & Electric Co.'s contract for Hetch Hetchy power, was decided in favor of the power company in superior court at San Francisco. The complaint, filed four years ago by a woman who never appeared in court, charged that, over a 15-year period, the utility had received approximately $100,000,000 from the sale of the power and had returned to the city about $25,000,000, whereas the entire amount should be returned.

● THE ELECTRIC HOUR, a half-hour radio program starring Nelson Eddy, is being sponsored on the Columbia network by a group of 170 electric companies. The show, heard on Wednesday evening at 7:30 PWT, continues the group radio advertising program started a year ago with *Report to the Nation.*

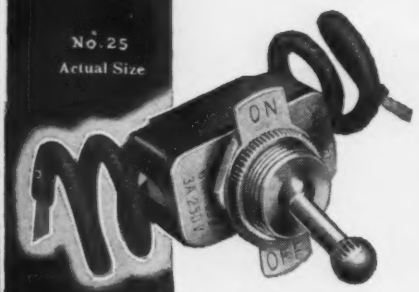
A number of important features have made Kuhlman Distribution Transformers the choice of many utility men. The Kuhlman patented B.I. (Bent-Iron) core utilizes to the fullest extent the many advantages inherent in present day materials.

The results of this unique design are lower exciting currents, reduced weight and improved operating characteristics. The tank is made of copper-bearing steel to resist the havoc of rust and corrosion. Pockets for primary and secondary bushings are pressed into the tank to protect bushing seats from the weather. Primary and secondary bushings are sturdily constructed to prevent breaking. In fact, each component part of a Kuhlman distribution transformer is chosen for its ability to take more punishment than it will ever be subjected to in use and thus to give long years of uninterrupted, economical service.



Vibration and Dust PROOF

No. 25 Actual Size



McGILL Toggle Switches

Here is a new addition to the McGILL line of dependable switches . . . the McGILL Toggle Switch, Nos. 25, 27 and 28 Series. This small, practical, thin, multiple switch is both vibration and dust proof. With a body only 1" long, ½" wide and ½" thick, it fits into the shallowest of places. Approved by the Underwriters' Laboratories, it is ideal for the individual control of small tools, fractional horsepower motors, industrial and office machines, appliances, motion picture projectors, floor and table lamps, airplane and trailer lights, lights in Pullman cars, passenger cars and busses.

They are made in three types. No. 25 single pole rated 6 amp. "T" 125 volts, 3 amp. 250 volts. No. 27, three way, rated 6 amp. 125 volts. No. 28 two-circuit, no off position, rated 6 amp. 125 volts. All types furnished with wire leads or solder lugs.

McGILL Toggle Switches are easily installed and built for long life. See your dealer, or write for further information.

McGILL MANUFACTURING COMPANY, INC.
Electrical Division
VALPARAISO, INDIANA

ADDITIONAL FUNDS VOTED FOR HEARINGS IN WEST

An additional $5,000 has been voted by the Senate for the sub-committee headed by Sen. Ernest W. McFarland, Arizona Democrat, which has been conducting hearings on dual-purpose reclamation projects in California and Arizona. It was understood that the additional funds are to finance further hearings, one of which may be held in New Mexico.

Two hearings already have been held, one concerning irrigation projects in California's Central Valley, the other at Phoenix, Ariz., on the possibility of diverting water to central Arizona.

British Columbia States Views on Land Inundation

Seattle City Light received assurance recently that British Columbia will cooperate in settling any financial difficulties that may arise from the flooding of 5,000 acres of Canadian land when the third step of the Ross Dam project is completed. During a meeting with City Light officials, Premier John Hart stated that no serious difficulties would be experienced in satisfying British Columbia interests.

Approximately 30,000,000 board feet of timber will be logged before Ruby Basin, above Ross Dam, is flooded. The project is part of Seattle's program to increase electric power capacity. At present, the Skagit power project is producing 75,000 hp. at Gorge Dam and 160,000 hp. at Diablo Dam. Ross Dam is expected to deliver 480,000 hp.

● AUTHORITY to extend for one year an agreement with the U. S. Geological Survey for a cooperative survey of the surface water resources of the city of Seattle's Skagit and Cedar River basins, is proposed to the city council by City Light Superintendent E. R. Hoffman. The city would contribute $8,500 for the work, $2,175 of which would come from the Water Department funds and $6,325 from City Light. The Geological Survey's contribution would be $7,300. Included in the program is the stream gauging of each river and the making of snow surveys in the two basins. The cooperative survey has been under way since July 1, 1939.

● AN EXPENDITURE of approximately $40,000 will be made by the Northern B. C. Power Co. for repairs to its dam at Lake Woodworth near Prince Rupert, B. C., it was reported recently.

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Jeffries Transformers

Reasonable in Price
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Jeffries large transformers are priced reasonably—and you can save their first cost in a short time by minimizing current losses. When you use a Jeffries transformer, you can provide voltage change at the point desired, without prohibitive expense.

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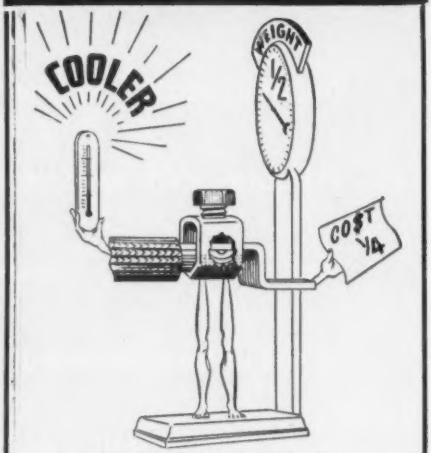
Electrical Connectors



PROVED BY TESTS

Recent tests made by a leading switch manufacturer proved that ILSCO 225 amp. SOLDERLESS CONNECTORS ran 12% cooler than a cast connector of another manufacturer whose connectors are twice as heavy and cost four times as much.

ILSCO CONNECTORS are cooler, lighter, and cheaper because they're built from 100% electrolytic pure copper drawn right in our own plant. Cast connectors, of course, are made of alloy copper with poor conductivity. Make the tests yourself . . . you'll appreciate ILSCO superiority.

Western Distributors:
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ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

ORDERS POURING IN!

Overwhelming TRADE ACCEPTANCE

FACTORY FACILITIES
ARE TAKING CARE OF THEM

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Most practical and highest quality starter yet devised.
Locks out . . . Resets AUTOMATICALLY.
No need to do anything to the starter.
Positively cuts out deactivated, flickering, blinking lamps.
Automatically cuts off current to ballast and lamp.
Longer life for ballast because defective lamp is LOCKED OUT. Prevents overheating.
RED PLASTIC CAN —distinctive, lighter, stronger. Higher dielectric strength. Can is SEALED. No projecting lugs.
Life of the Lloyd AUTOMATIC Starter is many times greater than that of the average lamp. Tested in production and before shipment to insure perfect performance.

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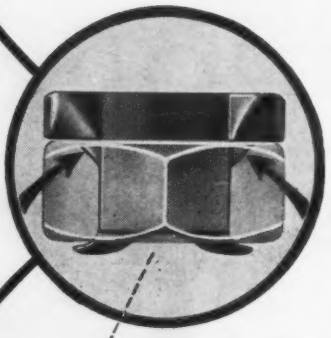
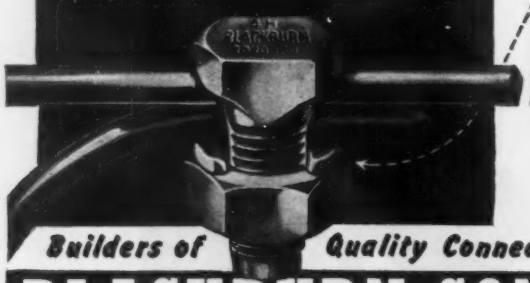
This Reinforcing
makes a STRONG CONNECTOR
STILL STRONGER!



Here's why — Any connector nut can exert its pressure at only two points. But the bridge-like pressure bar of BLACKBURN CONNECTORS distributes this pressure over the entire length of the connection. Like the tie rods on a bridge, the two reinforcements greatly strengthen the pressure bar, and give it maximum rigidity.

Shown above is the nut and pressure bar of a BLACKBURN CONNECTOR. Small arrows indicate how this is reinforced with a fillet on each side.

Over 100 Conveniently-located Jobbers' Stocks



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Builders of *Quality Connectors for Over 10 Years*

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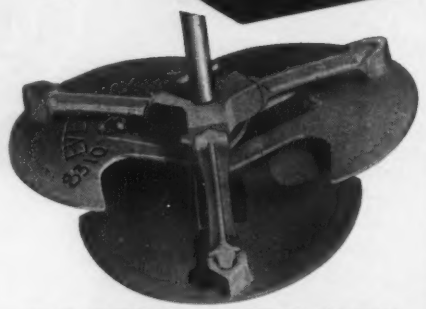

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For dependable anchoring under all conditions, use Eversticks. Made of tough, rust-resistant, malleable iron . . . quick and easy to install . . . expand in undisturbed earth. Preferred by engineers and crews alike.

Write for latest Everstick bulletin.

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THIRD UNIT INSTALLED AT B. C. ELECTRIC PLANT

Installation of the third 8,000-kw. steam-turbo generating unit has been completed at B. C. Electric's Brentwood steam plant serving the southern section of Vancouver Island. The plant equipment has been on order for the past three years, but wartime conditions have delayed delivery and installation.

The present power house structure was completed in 1912, when two steam-turbo units each of 2,000-kw. capacity, were installed and placed in operation with a battery of six Babcock and Wilcox oil-fired boilers with auxiliary equipment. Space was provided in the power house structure at that time for additional units when they might be required.

When the plant was built in 1912, it was designed to serve as a standby for the company's main hydroelectric generating plant at Jordan River. Since that time, the capacity of the hydro electric plant at Jordan River has been steadily developed, and, since this meant the utilization of more water at Jordan River, it became increasingly necessary to operate the Brentwood plant in conjunction with the Jordan River plant during the dry period. Under today's conditions, with a record demand for power for essential war industries in Victoria and district, increased population and a materially increased street railway load, the Brentwood plant has ceased to be merely a standby plant and is now playing a part in meeting the base load requirements of the company's Vancouver Island territory.

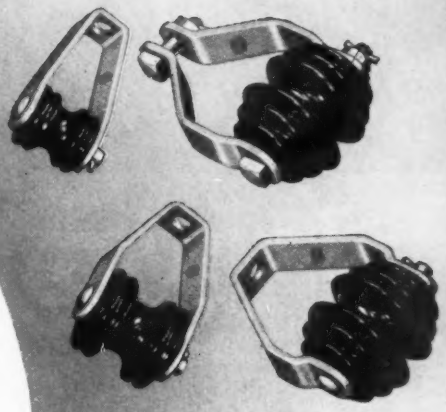
● INITIAL 35,000-hp. unit in the 140,000-hp. hydroelectric development at Brilliant, B. C., has been completed and is delivering power, according to L. A. Campbell, West Kootenay Power & Light Co. president. A second unit is about 90% complete and is expected to go on the line soon.

When power requirements demand installation of the additional two units for which provision has been made at Brilliant, total developed horsepower on Kootenay River will be brought to more than 400,000 hp.

● POWER PRODUCTION in British Columbia last year was led by the West Kootenay Power & Light Co. with a 1,640,507,895-kwh. output, according to the annual report issued by the Public Utilities Commission. B. C. Electric Railway Co. was second, with 759,645,589 kwh. East Kootenay Power Co. generated 119,931,424 kwh. for third place.

How to build

HIGH-VOLTAGE RELIABILITY INTO LOW-VOLTAGE LINES



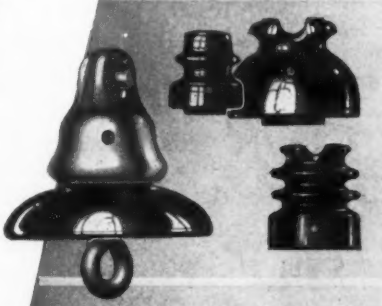
INSULATED CLEVIS ASSEMBLIES—Larger sizes have hardware so shaped as to increase flashover value of units.

STRAIN INSULATOR FITTINGS—Eliminate cable serves. Quick to install. Work insulators safely at higher loads.

DEAD END THIMBLES—Permit replacement of insulator without cutting or disturbing conductor. Also applicable to angles.

ANGLE CLAMPS—One clamp fits full range of cable sizes. Fits angle construction from 10 to 120 degrees.

UNIVERSAL STRAIN CLAMPS—Develop full cable ultimates. Slip strengths in excess of 90 per cent of ultimate.



INSULATORS—All made of fine, high-voltage, wet ware porcelain. Superior manufacturing and design standards show up in superior performance.

NEUTRAL CLAMPS—For grounded neutral conductor. Main jaw is threaded so that clamp remains tight regardless of pole shrinkage.

LINE outages can't be rated in terms of voltage--it takes the time of men to restore service, whether the line is 1,000 or 100,000 volts, and men's time today is a scarce article. Also, because there are so many low-voltage lines, it is doubly imperative to build these lines well. You can be sure of this when you use O-B insulators and hardware...The same designing skill, the same research facilities, the same fine materials, and the same manufacturing plant are behind O-B distribution materials as behind those for the heaviest-voltage applications. O-B low-voltage equipment is built with a high-voltage point of view that shows up in greater reliability... And it's easy to buy O-B distribution materials. Just reach for your telephone and call your nearest Graybar Electric representative.

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Order your EMT fittings from the complete T&B Line—Couplings, Connectors, straight and angle, Entrance Caps and Ells. Also T&B Benders, Wrench and Reamer Tools and Hickeys for EMT. All you need to meet every EMT requirement.

All made on the well known T&B ribbed gland type principle which permits tightening with either wrench OR pliers.

Approved by the Underwriters Laboratories on rain-tight and pull-out tests.

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$9,000,000 OFFERED FOR TUCSON PROPERTIES

An offer of $9,000,000 for properties of Tucson Gas, Electric Light & Power Co., a subsidiary of Federal Light & Traction Co., was made recently by Mayor Henry O. Jaastad of Tucson, Ariz., in a telegram to C. H. Nichols, president of Federal.

The offer was made in accordance with a recommendation by the Tucson city council and a recently appointed citizens' utilities committee. The committee had urged early steps toward acquisition of the properties in order to forestall a possible offer in excess of the $9,000,000 valuation fixed by Duff & Phelps, Chicago engineers employed by the city to appraise the properties.

Tucson residents voted last February to acquire the utility properties, and condemnation proceedings were brought in federal court by the city and by the suburb of South Tucson, which had voted bonds for a take over of the private concern. (E. WEST March 1944.)

● CALIFORNIA ELECTRIC POWER Co. has acquired the properties of Compania de Luz Electrica de Mexicali, S.A., through its own subsidiary Industrial Electrica Mexicana, S.A. In the past the company sold power wholesale to the first named company but now through its subsidiary owns the distribution system and the Mexican company outright. D. W. Lothrop, vice-president of the Mexican company, becomes vice-president and general manager of the new company with Lloyd Loudon as superintendent. Loudon was district manager at Calexico for several years prior to the sale of the Imperial Valley power system to the irrigation district.

● CONSTRUCTION of power lines near Lebanon, Ore. was halted by WPB recently, following action of Mountain States Power Co. to enjoin the REA from building in the area. Both the power company and the REA had surveyed for the construction work and REA had been given the go-ahead signal by WPB. When Mountain States asked for the injunction, WPB issued stop work orders for both company and REA.

● APPLICATION filed by Francis N. Dlouhy of Los Angeles for preliminary permit for a 950,000-hp. hydroelectric project on the Kings River in California was turned down last month by the Federal Power Commission. The application covered 13 dams and reservoirs to be interconnected for the development of power in four powerhouses. Permit was denied on the grounds that it would be inconsistent with the public interest until studies now under way by federal agencies, looking to development of the Kings River watershed, had been completed and it was determined to what extent development should be undertaken by the government.

California Public Service Systems Go To PG and E

Pacific Gas and Electric Co. will purchase electric distribution systems of the California Public Service Co. in Willits, Fort Bragg and other communities in Mendocino County, Calif., for $350,000 par value preferred stock, if the deal is approved by the California Railroad Commission and the Federal Securities Exchange Commission, it was announced recently by the power company.

The two systems serve about 3,000 electric customers in the area largely devoted to lumber operations and dairy farms.

The Willits electric system consists of local distribution lines and a transmission line extending to Willits from PG and E's Potter Valley generating station in Mendocino County, from which power has been purchased in the past.

The Fort Bragg electric system, which is not connected with the Willits lines, now purchases its electric supply from the Union Lumber Company.

Pacific Gas and Electric plans to improve the Potter Valley-Willits transmission line and, when conditions permit, to make certain extensions of service facilities.

● EFFORTS of Utah Light & Traction Co., subsidiary of Utah Power & Light Co., and Salt Lake City Lines to obtain early dismissal of a suit to void sale of U. L. & T. facilities to Salt Lake City Lines failed recently, when Federal Judge Tillman D. Johnson denied a motion to dismiss the action without hearing. Five Oregon stockholders of the traction company are attempting to void the sale on charges of collusion. The stockholders were expected to file an amended complaint.

● CONDEMNATION suit by which the Sacramento Municipal Utility District is attempting to acquire distribution facilities of Pacific Gas and Electric Co. in its territory has been submitted to Judge C. J. Goodell of San Francisco. Goodell indicated that he might issue an order of judgment within a month.

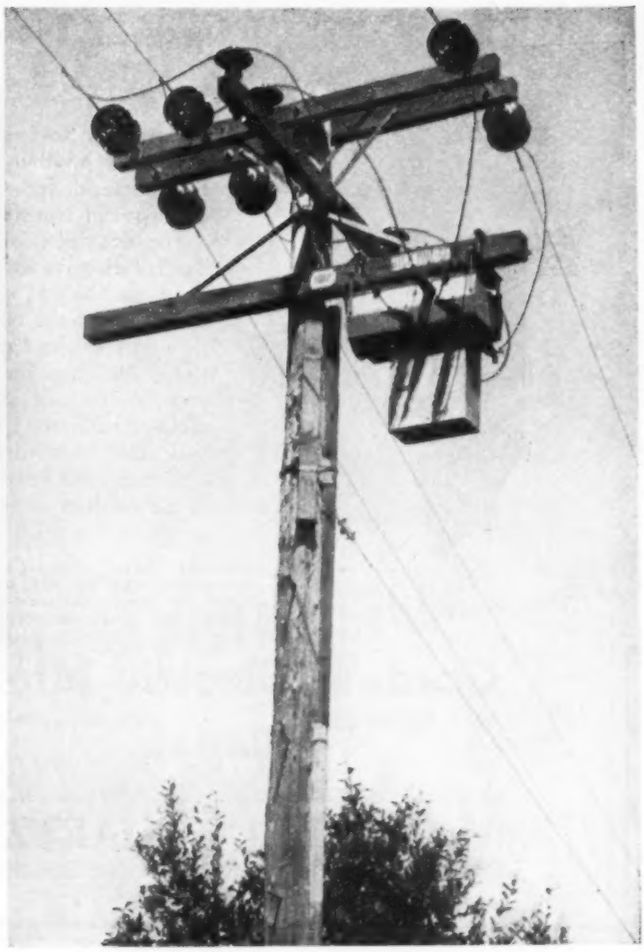
HERE'S

INSTANT *FAULT* CLEARANCE

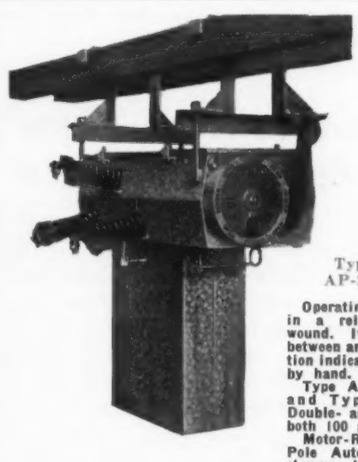
FOR RURAL OR LOW-REVENUE DISTRIBUTION LINES

PACIFIC ELECTRIC'S

Automatic Service Restorer



ENDS MOST LONG OUTAGES THAT SO OFTEN FOLLOW BLOWN FUSES



Type AP-1, Type AP-2, Hand-Wound

Operating energy is stored in a reliable spring, hand wound. It can be rewound between any faults. Has position indicator. Can be tripped by hand.

Type AP-1, 7.5/12.5Y-kv., and Type AP-2, 15-kv., Double- and Three-Pole units, both 100 amps., 60 cycles.

Motor-Rewound and Single-Pole Automatic Service Restorers also available.

Pacific Electric's Automatic Service Restorer offers excellent continuity of service for rural or low-revenue distribution lines.

Its low first-cost and low upkeep bring the Service Restorer well within the operating economies of the system.

With it, most of the long outages that so often follow fuse protection are eliminated.

You get three automatic reclosures on transient or sustained faults before it locks out on the fourth opening.

At anytime between faults, the line patrolman can easily hand-rewind the operating spring and again you have a cycle of three-reclosure protection. No auxiliary power supply needed.

As all poles of the Service Restorer open together, single-phase operation of three-phase equipment and dangerous feed-backs are prevented. You get a selection of predetermined closing-time intervals. As for safety, good design and long lasting construction, *all of that* has been proved on scores of utility lines the nation over.

For full details of instant clearance of faults on rural or low-revenue distribution lines, write today.

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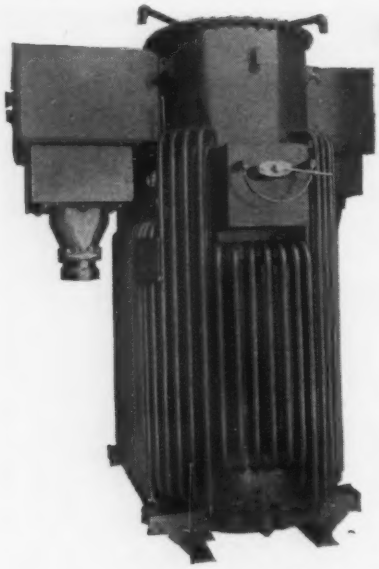

Gardner Transformers Are Also Easier to Set

Attention to even minor details of design is another factor increasing the demand for Gardner standard and special transformers.

For example, on the transformer illustrated, note the rugged base with channels so that pole jacks can be used for lifting. Note also the extra side ears at the top to provide additional facilities for ease in shipping and handling. Small details like these make Gardner transformers easier and safer to handle.

Consult this Pacific Coast specialist in connection with your transformer needs.

Gardner 750-kva, 3-phase 2400/240-volt transformer with tap changer, and pot-heads on primary and secondary installed in terminal boxes welded to the case.

Gardner Electric Mfg. Co.

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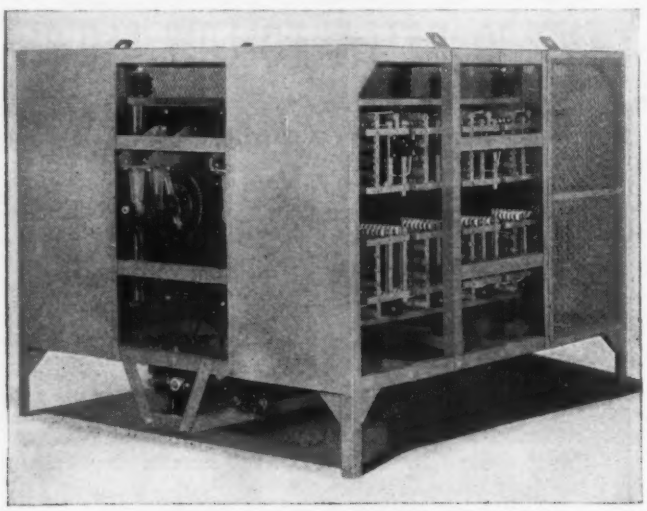
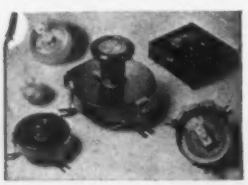


ASSEMBLED RHEOSTATS

This Ward Leonard rheostat, built for production testing of grid controlled rectifier tubes, consists of five face plates, each composed of two rheostats. Each rheostat will drop from 0 to 375 volts at any current from 15 to 0.15 amperes. Series connected they drop 3750 volts. Parallel connected they handle currents up to 150 amperes.



Ward Leonard rheostats provide control for the minute current requirements of the laboratory to the heaviest current demands of industry.

Send for Rheostat Bulletins of Interest to You.

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Electric control (WL) *devices since 1892.*

ARMY E NAVY

WARD LEONARD ELECTRIC COMPANY, 68 South St., Mount Vernon, N. Y.

LOWER MINIMUM CHARGES APPLY IN VANCOUVER

To encourage greater conservation of electricity in face of threatened shortage, the B. C. Electric Railway Co. has announced a reduction in minimum monthly charges for domestic and commercial lighting consumers.

Precipitation in watersheds was declared at a new low last month by Chief Engineer Thomas Ingledow, who stated that the emergency would be relieved only by heavy rains over a long period. Federal release of fuel oil allowed the utility to resume full-time operation of its Vancouver steam plant during September.

The order, which bears the approval of the Public Utilities Commission, applies to the Lower Mainland system. It affects all residential minimums which are normally above 50 cents; commercial lighting minimums which normally exceed $1 monthly.

There will be no change in charges for flat rates or accounts having monthly guarantees of revenue bond or otherwise. Nor will there be any change in present minimum monthly charges for power.

The reduced minimum monthly charges will apply during the present emergency after which the normal minimums will again prevail subject to the company's giving 15 days' notice to the Public Utilities Commission. The reductions were to apply to meter readings on and after those of August 14.

Rate Reduction Designed to Wipe Out Excess Profits Tax

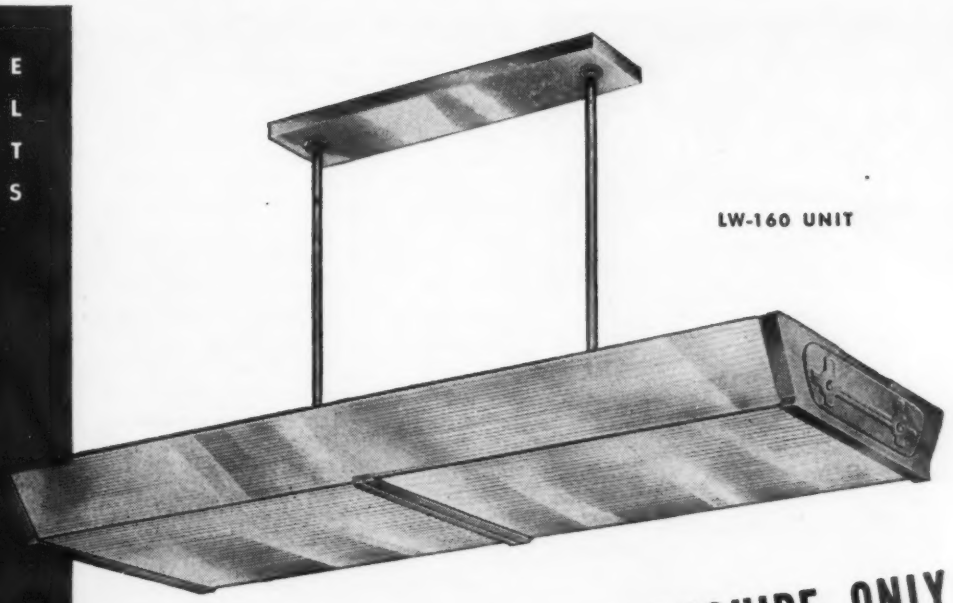
Tentative agreement between Coast Counties Gas & Electric Co. and the California Railroad Commission to wipe out payment of excess profits taxes beginning in 1945 and reduce electric and gas rates approximately $500,000 annually was made permanent by order of the commission last month.

Under the new rate set-up, which became effective Oct. 1 and will continue six months after peace is declared, reduction will be affected through discounts to apply above minimum charges. Approximately $399,894 of the reduction is represented by excess profits formerly paid to the federal government.

Meanwhile no decision had been announced in the move to force 130 California utilities to make similar reductions through elimination of the excess profit tax from base rates.

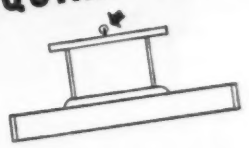
WESTINGHOUSE COMMERCIAL FLUORESCENT LUMINAIRES

ARE EASY TO INSTALL



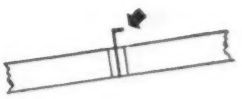
LW-160 UNIT

TWIN STEM HANGERS REQUIRE ONLY ONE POINT OF SUPPORT

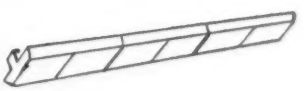


SINGLE UNITS ARE CEILING MOUNTED WITH TWO SIMPLE BRACKETS

CONTINUOUS ROWS REQUIRE ONLY ONE HANGER OR BRACKET PER FIXTURE



UNITS CAN BE JOINED FOR CONTINUOUS ROWS



You'll never find more versatile lighting units than the new Westinghouse Fluorescent Commercial Luminaires. Each model in the entire, complete line can be stem or ceiling mounted — hung singly or continuously. What's more, each unit requires a minimum of time for mounting — with fewer holes to drill, less hangers or fixtures to install, and line leads made accessible by loosening one screw.

Easy and flexible mounting of Westinghouse Fluorescent Commercial Luminaires means a savings in installation cost — less disturbance or time-out for personnel in relighting your office or drafting room. Full details are available from your nearest Westinghouse Lighting Distributor. J04010

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PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Lighting Equipment

Sherman High Strength Bronze Service Connectors

It's a pleasure to announce that we are again stocking and shipping these fine quality Sherman Split Bolt Connectors that are so universally liked.

Sherman Connectors are made from silicon bronze averaging more than 90,000 lb. tensile strength per square inch. Threads on the body are not pressed or stamped, but are die cut and checked with precision gauges to mate perfectly with the tapped threads in the nut.

All connectors have full hex heads and nuts are extra thick. The solid, reinforced spacers provide maximum bearing surface on the wire and nut. Extra long pilot, for easy assembly.

Extra Length connectors available for three wires.

Write today for Trade Bulletin 22 giving full data!

H. B. Sherman MFG. CO.
BATTLE CREEK, MICHIGAN

ALUMINUM PRODUCTION CURTAILED ON COAST

Three West Coast DPC aluminum plants were affected by a WPB order last month which further curtailed aluminum production. The power outlook was materially affected, particularly in the Pacific Northwest where low water had seriously cut into available supply and where steam plants had been shut down to conserve oil.

The WPB order closed down the Los Angeles reduction works completely. Production had been running 9.5 million lb. monthly as against a rated capacity of 15 million lb. The Spokane plant was reduced from 18 million lb. monthly to 6 million lb. and the Troutdale, Ore., plant from 8.7 million lb. to 3 million lb. In addition the curtailment order reduced output from the Vancouver plant of the Aluminum Company of America. Alcoa operates all of the Western plants affected by the order.

● WITH CURTAILMENT of aluminum production at Vancouver, Wash., Aluminum Co. of America has announced decision to terminate two short term power contracts with the Bonneville Power Administration. One contract was to be cancelled the end of September and the other in February, 1945, according to C. S. Thayer, Vancouver plant manager.

● ADDITIONAL Boulder Dam power will be released to southern California when the Basic Magnesium plant at Las Vegas, Nev. is shut down. Cutbacks, which have reduced operations 60%, have released about 400,000,000 kwh. on an annual delivery basis and it is expected that this will be increased to $900,000,000 kwh. with the final cutback in December.

● ALTHOUGH PRIORITIES have been secured for only one of the two proposed 25,000-kw. generators for Tacoma City Light's Alder Dam power house, the city will begin operation of the plant at half capacity early in 1945, it was announced recently by George Gregory, electric and hydraulic engineer in charge of construction. The first of the generators will be delivered early in January, according to present schedules. Storage of water will begin in October, forming a reservoir which will inundate 3,100 acres of land and form an artificial lake about seven miles long in the Nisqually Valley.

● AMERICAN STANDARDS ASSN. has moved from 29 West 39th St. to larger quarters in the Grand Central Terminal Office Bldg., 70 East 45th St., New York 17.

A high-climbing blowsnake caused a three-minute blackout in Ogden. The snake crawled up a 30-ft. tower at a Utah Power & Light plant

Electronics Meetings Scheduled In West

Don Caverly, author of the McGraw-Hill book *A Primer of Electronics* and one of Sylvania Electrical Products, Inc. research engineers, will address groups of the Illuminating Engineering Society and allied organizations on a brief tour of the West Coast in October. With an elaborate demonstration board he will speak on *Fundamentals of Electronics and Their Application to Industry* Oct. 2 to the Washington Chapter of Illuminating Engineering Society, Seattle; Oct. 4 to the Oregon Chapter in Portland. On Oct. 9 he addresses the Electric Club of San Francisco as the special guest of the IES and with members of the architects association in attendance. In Los Angeles he holds a meeting with IES and affiliated groups Oct. 16.

● AN INTERNATIONAL ELECTRONICS exposition, sponsored by the National Electrical Manufacturers Assn., Electronics Section, is scheduled to be held in 1945 if general conditions permit. Place for the meeting has not been set and time will be in the latter part of the year. Exhibits will be restricted as much as possible to working exhibits or demonstrations which utilize electronic principles. Provision is to be made for sessions or clinics on technical subjects under sponsorship of technical groups.

Rolled metal edge makes cutout strong, easy to install.
Oxidized-copper dielectric element gives excellent uniformity of operation.
Stiff fiber insulation makes cutout mechanically sturdy. Also excludes moisture.

For low-cost, dependable FILM CUTOUTS

for your series-lighting sockets specify "G-E Novalux"

They're DESIGNED to

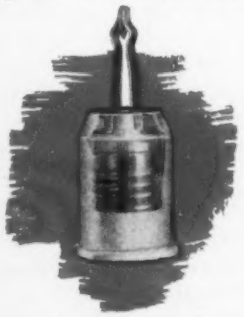
- *Reduce servicing time*
- *Prevent "duds" due to handling*
- *Minimize unscheduled "blackouts"*

Small as they are, cutouts can make a big difference in the continuity and the service costs of your series lighting.

G-E Novalux copper-oxide film cutouts are built to unusually high uniformity, mechanically and dielectrically. They are not affected by heat, dampness, or pressure. The oxidized-copper dielectric element is enclosed in a moisture-proof aluminum and fiber casing which resists damage and will not come apart.

Of course, G-E Novalux cutouts are standard equipment for G-E Novalux series sockets—but regardless of what makes of sockets are installed in your system, you can use Novalux film cutouts as replacements.

For further information, write or phone the nearest G-E office. *General Electric Company, Schenectady 5, N.Y.*



These sturdy, high-quality series sockets will save time and money on maintenance, and will prevent many service outages. They withstand temperature changes, vibration, and atmospheric corrosion that have often caused street lighting sockets to fail. They are standard equipment for G-E Novalux luminaires—but they can also be used as replacements in any series luminaires you are using.

Novalux Renewal Parts catalog—complete, well illustrated—facilitates checking stock and ordering parts. Write for a copy of GEA-4084.

Buy all the BONDS you can
—and keep all you buy

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RENEWAL PARTS
for Luminaires

GENERAL ELECTRIC

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For "Out-In-Front" Performance!

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PEOPLE
made this news

Van Norman Retires From Los Angeles Municipal

H. A. Van Norman retired on Sept. 30 as general manager and chief engineer of the Los Angeles Department of Water & Power. He is succeeded by Samuel B. Morris, former dean of the Stanford University school of engineering.

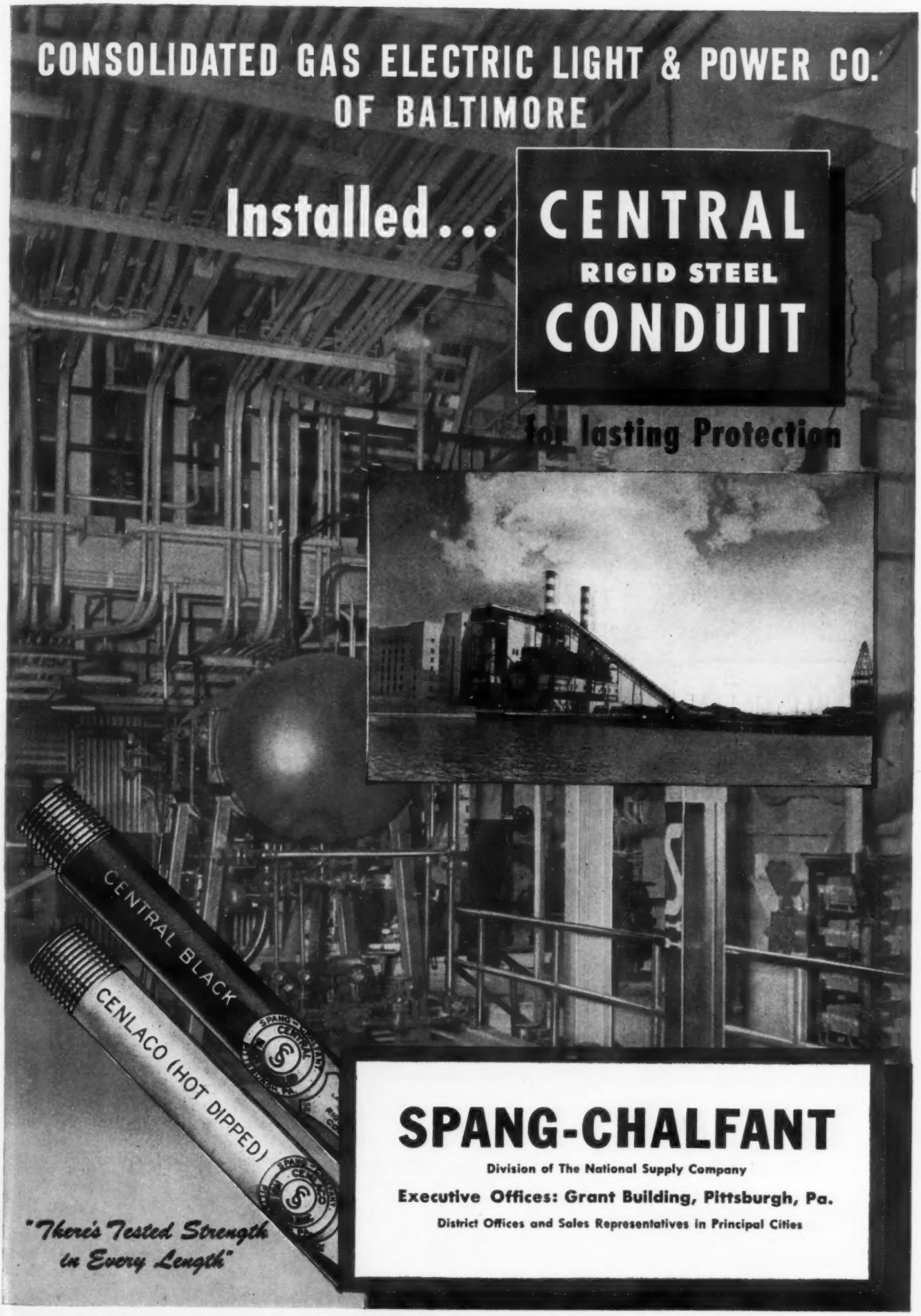
Van Norman first joined the department in 1907 and, with William Mulholland, pioneered development of the city's aqueduct system. He was head of the water bureau for many years and became chief of the combined water and power bureaus when the new set-up was completed a year ago. He will stay on as an advisory engineer until Jan. 1.

Morris is a native of Los Angeles and attended the Throop Polytechnic Institute (now California Institute of Technology) and Stanford. In 1935 he became professor of civil engineering at the university and was made dean in 1936. Previously he was general manager of the Pasadena Municipal Water Department. He has held engineering consultant positions up and down the Pacific Coast, including work in connection with Bonneville and Grand Coulee dams. He is currently president of the American Water Works Assn.

● EARL FINLEY was recently appointed chief system dispatcher for San Diego Gas & Electric Co., filling the position left vacant by the death of A. W. Keith. E. M. Foster was named assistant chief system dispatcher, a position Finley formerly held.

● JAMES B. BLACK, president of Pacific Gas and Electric Co., has been elected a director of the U. S. Steel Corp. to succeed the late William J. Filbert. His election is the first to the steel corporation board from the Pacific Coast.

● MELVIN E. LANNING, for a number of years in the electrical business in the West, has been appointed merchandise manager of the Westinghouse electric range department. He was with Westinghouse in Denver and Salt Lake City, and at one time operated his own appliance dealership in California.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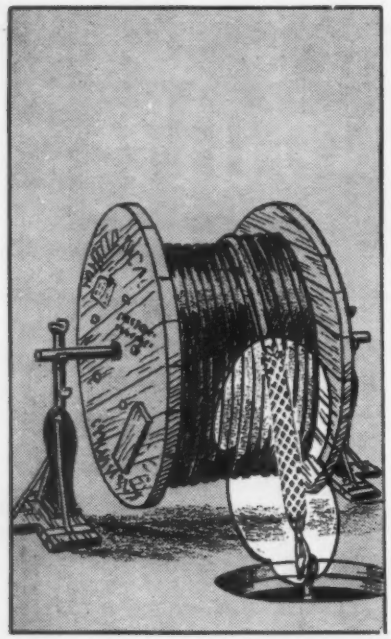
OF BALTIMORE
Installed...
CENTRAL
RIGID STEEL
CONDUIT
for lasting Protection
CENTRAL BLACK
CENLACO (HOT DIPPED)
"There's Tested Strength
in Every Length"
SPANG-CHALFANT
Division of The National Supply Company
Executive Offices: Grant Building, Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities

SPEED
CONSTRUCTION
and EXPANSION
of PLANT FACILITIES



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For Pulling in
Wires and Cable

These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because wires pull with evenly distributed load. Eight different styles—all supplied in a full range of sizes.

Reliable
ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
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Gawan Goes In Business As Consulting Engineer

Louis B. Gawan, formerly commercial sales manager with Utah Power & Light Co., has gone into business for himself as electrical consulting engineer to architects and industrials in the Salt Lake City area. His work will be in the general field of planning of lighting and electrical distribution facilities.

At one time engaged in civil engineering, Gawan joined the electrical industry in 1917, when he was employed by Utah Power & Light Co. to sponsor extension of rural electric service and irrigation projects in northern Utah and southern Idaho. He later specialized in commercial engineering and illumination design and, at inception of the Electrical League of Utah's lighting bureau in 1923, he became director of the activity. He rejoined the power company in 1929, becoming commercial sales manager, a position he held until shortly before Pearl Harbor. Recently he has been associated with Ashton, Evans & Hodgson, architects and engineers, and has had charge of design and construction of electrical facilities for war construction.

In 1924, Gawan won an award sponsored jointly by NELA and IES and, as a result, received special training at Electrical Testing Laboratories in New York City, the Bureau of Standards in Washington, D. C., and at research centers of G-E and Westinghouse and the Case School of Applied Science. He was local IES representative from 1924 to 1940 and has served as chairman of several Northwest Electric Light & Power Assn. committees.

● APPOINTMENT of Ralph Wells Moulton, assistant professor of chemical engineering, University of Washington, as consultant for Bonneville Power Administration was announced recently in Portland, by Ivan Bloch, chief of Bonneville's division of industrial and resources development. Moulton will conduct research studies looking toward development of commercial uses for mineral resources of the Pacific Northwest. These will include the large titanium iron ore deposits near the mouth of the Columbia River, and the chrome ores found on the Oregon coast.

● PAUL RODET was officially appointed chief of the Los Angeles Department of Electricity Aug. 1 by the Board of Building and Safety. He was former assistant chief electrical inspector and has been with the department for the past nine years, previous to that operating his own electrical contracting firm in Los Angeles. The appointment is to last for the duration and an examination for the position will be held following the return of the men in the armed services. When R. H. Manahan retired as chief this arrangement was made.

● J. P. D. MALKIN, director of the War Assets Corp., and the W. H. Malkin Company Ltd., Vancouver, B. C., was elected first chairman of the board of directors of Neon Products of Western Canada Ltd., Vancouver, at the annual meeting held at Vancouver, B. C., recently. Malkin was president in 1943. George M. Sweny was elected president and managing director. Vice-presidents are Hon. W. C. Woodward and Gordon Farrell, and secretary-treasurer, C. C. Corbet.

● DANA W. ROWTEN, illuminating engineer at Public Service Co. of Colorado was the only Westerner on the program of the technical conference of the Illuminating Engineering Society at its 37th annual meeting Sept. 14, 15 and 16 at Edgewater Beach Hotel, Chicago. Rowten discussed Denver's mercury street lighting system.

● CHRIS D. MCKEON, a building contractor and a member of the board for the past three years, was elected chairman of the California Contractors' State License Board, succeeding Roy Butcher, San Jose electrical contractor. Butcher, however, remains on the board as one of the specialty contractor representatives. He has been its chairman for the past three terms.

● ALFRED H. NICOLL, president and director of Graybar Electric Co. and former San Francisco manager, has been named on the Board of Trustees of the Illuminating Engineering Society Research Fund. The fund is to be used for illuminating engineering research in cooperation with the research laboratories of leading universities and other institutions.

● JOSEPH WALTA, of Littlejohn-Reuland Corp., Los Angeles, was named chairman of the cost data committee and T. L. Rosenberg, Oakland, Calif., a member of the membership committee of the National Industrial Service Assn., Inc. for the fiscal year ending March 31, 1945. Rosenberg is also a member of the board of directors.

● C. GARTH DICKENS has joined the Seattle staff of Westinghouse Electric & Mfg. Co. as application engineering assistant. A native of Tacoma, he was graduated last year from the University of Washington.

for... Speed Low Cost

In Re-maintenance

Connect With the Line of Least Resistance!

The war record of the electrical industry in "holding the line" under unprecedented power demands, and the shortages of materials and manpower, is a *monument of praise* to the maintenance engineers whose planning and "know-how" enabled them to conquer problems heretofore thought impossible.

This same "know-how" is now being brought to bear on the big re-maintenance job just ahead . . . to insure maximum efficiency and *permanency* of many war-born installations.

Logically, Burndy engineers are cooperating on many of these programs, for wherever *speed, permanency* and *low-cost* are the prime connector requirements, Burndy has the answer. This complete connector engineering service is yours, too, for the asking. Burndy Engineering Co., 107 Bruckner Boulevard, New York 54, N. Y.

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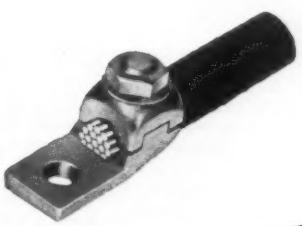

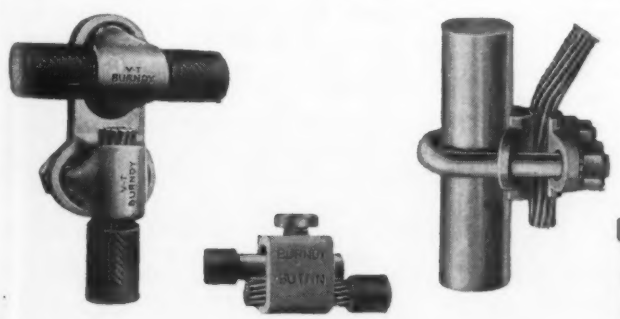

Headquarters for CONNECTORS

Burndy

● GENERAL ELECTRIC CO. has announced appointment of R. O. Brosemer and O. A. Gustafson as assistant district engineers at San Francisco. Gustafson will assist Walter C. Smith, district engineer, in general administrative duties and Brosemer will devote most of his time to administration of federal and marine work.

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THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

There is a Tork Clock for every regular switching job: 60 minute, 4 hour or daily cycles.

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To meet your requirements for a combination lug for cables ranging from No. 8 sol. to 1000 Mcm.

The feature of this Type "XL" Combination Lug is the adjustable pressure plate which can be tightened or loosened to accommodate a wide range of cable sizes. The body is cast copper alloy; socket set screws and wrench are furnished.

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Write on your letterhead for the new O.Z. catalog containing complete information and prices on Conduit Fittings • Cable Terminators • Junction Boxes • Solderless Connectors • Power Connectors • Grounding Devices.

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JOSEPH D. SMMOTT . . . . . 1203 Western Ave., Seattle 1, Wash.

Black, Warren Join Triangle Pacific

Two well-known men in the industry have just joined Triangle Pacific Co. In San Francisco Gordon F. Black, illuminating engineer and electrical engineer, has joined the company to handle the Mica Insulator Co. line. Black was lighting director for the California Electric Power Co. at Riverside and resigned after Pearl Harbor to join the U. S. Engineer Corps as electrical engineer, heading the electrical section for the Fortifications Division charged with construction of harbor defenses of San Francisco.

Mica Insulator Co. has recently appointed Triangle Pacific Co. as agents in the states of California, Oregon, Washington, Arizona, Nevada, and Utah.

Howard S. "Skip" Warren also recently resigned from Westinghouse Electric & Mfg. Co. at Phoenix to join the Triangle Pacific Co. Warren was formerly central station man for Wemco in Los Angeles.

● C. A. RUSSELL, former general sales manager for Wesix Electric Heater Co., has opened offices in the Western Merchandise Mart at San Francisco as manufacturers' representative. Under the name of Russell & Co., the new firm will specialize in electric heating and cooking equipment. Since war was declared, Russell has been serving war agencies. He was at one time director of civilian protection for the northern California sector and later was state training officer for the California State War Council, training civilian defense personnel. He was promoted to deputy director of the civilian defense of the State War Council, resigning in September when his duties were over.

● JOHN MARVIN COOK has been appointed manager for the San Francisco district sales office of Cutler-Hammer, Inc. Cook joined the firm in 1928 and has come to the West from the Cincinnati district. He will have charge of sales in northern California, western Nevada and part of Oregon.

● JOHN P. RAINBAULT has gone into business as a manufacturers' representative, with offices in the Phelan Bldg. in San Francisco. He formerly was with General Electric Co. in the air conditioning and commercial refrigeration department.

● WESTERN INSULATED WIRE INC. of Los Angeles has announced appointment of Edgar H. Hammond, Jr. as manager of sales and field engineering. Hammond started with the electrical wire and cable industry in 1923 as an employee of the American Electrical Works, now the Kennicott Wire & Cable Co. of Phillipsdale, R. I. He was district sales manager at the outbreak of the war, when he was given leave to serve as assistant director of the WPB copper division in Washington, D. C. He resigned this position in August.

Starkweather Succeeds Sues With Meyberg Co.

Leo J. Meyberg Co. has announced appointment of Lloyd E. Starkweather as vice-president in charge of operations in southern California, with headquarters in Los Angeles.

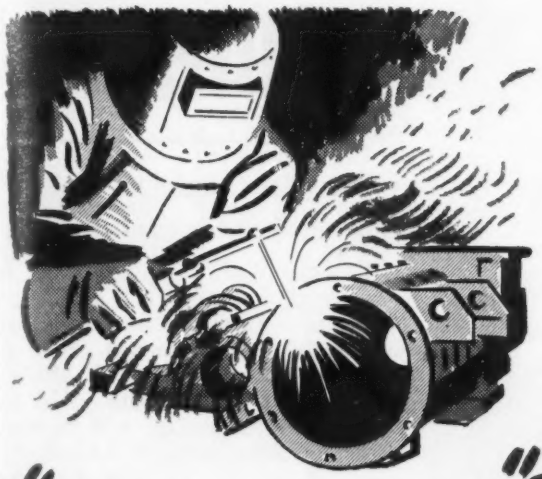
Starkweather succeeds M. G. Sues, vice-president since 1940, who has resigned to become southern California distributor for Zenith Radio Corp. Originally in the radio business, Sues had been with John G. Rapp Co., distributor of Kolster Radio in San Francisco in 1923, when he joined the Meyberg organization.

Joining the Leo J. Meyberg Co. as a salesman in southern California after extensive experience in radio and record sales management, Starkweather in 1934 became manager of the radio department in Los Angeles. In January 1943, he was made general sales manager, continuing in this capacity until his appointment as vice-president.

● JACK C. WILSON has been appointed Pacific district manager for the radio division of Bendix Aviation Corp. He formerly was senior administrative officer of the Army Signal Corps production field office in San Francisco. Wilson will handle the territory comprising California, Oregon, Washington, Arizona, Nevada, Utah, Idaho and Montana. His headquarters will be in San Francisco.

● JOHN A. DUNCAN, formerly of Westinghouse Electric Supply Co., Los Angeles, has become representative for Oliver Iron & Steel Corp., of Pittsburgh, Pa., makers of pole line hardware and specialties. He will operate with Wesco as headquarters in Los Angeles.

● APEX ELECTRICAL MFG. CO. has appointed L. D. Stull as Western division manager to direct sales of washing machines, ironers and vacuum cleaners in the eleven Western states. Stull formerly was with Frigidaire division of General Motors Corp. His headquarters will be in the company's Western division sales offices in the Furniture Mart at San Francisco.



With new traction motors almost impossible to get, many over-age motors must be kept on the job. Here's one way traction companies are doing it.

"Worn-out" Traction Motors

GO BACK GOOD AS NEW

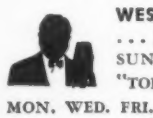
Passing over rail joints day after day gives traction motors a severe pounding. Wear is bound to develop in housings, tapped holes and axle bearing parts.

In normal times, badly worn motor frames would be discarded. But not today. A service developed by Westinghouse *Manufacturing and Repair** Plants, conveniently located in your district, is keeping them on the job.

Worn frames are delivered to Westinghouse M & R Plants. By a special welding process, tapped holes, housings and axle bearing parts are built up, then redrilled and remachined. The frames are returned as good as new, ready for many more years of service.

Many large traction companies use this Westinghouse M & R service . . . another example of the ability of this factory-trained organization to handle electrical repair problems economically and efficiently.

J-90518



WESTINGHOUSE PRESENTS
. . . JOHN CHARLES THOMAS
SUN. 2:30 EWT., NBC.
"TOP OF THE EVENING"
MON. WED. FRI. 10:15 EWT., BLUE NET.

When vital electrical equipment needs repair . . . phone the nearest office of Westinghouse Electric and Manufacturing Company for

Westinghouse

COMPLETE REPAIR SERVICE

*33 M & R PLANTS • • ONE NEAR YOU

● ROY BROWN has resigned as superintendent of the Provo, Utah, municipal power plant and will accept a nonmilitary assignment as inspector with the Ninth Service Command. In a temporary set-up, Harold B. Gardner has been made acting engineer in charge of boilers and turbines and Von Watkins, acting engineer in charge of maintenance.

● E. P. MARKEE, manager, Lamp Department, General Electric Co., Los Angeles, has become president of the Los Angeles Sales Managers' Assn.

OBITUARY

R. B. King

R. B. King, 65, general superintendent and one of the directors of the Idaho Power Co., died Sept. 8, at Boise. He had been in poor health for several months.

He was born at Ligonier, Ind., where he attended grammar and high school. He studied electrical engineering and drafting, and during the Spanish-American war served nine months with the 157th infantry.

After the war, Mr. King was employed by the Southern Ohio Bell Telephone Co., and about 1900 went to Colorado Springs, where he was associated with the Southern Colorado Power Co. In 1901, he transferred to Cripple Creek, where he worked under William T. Wallace, first president of Idaho Power, who was then president and manager of Southern Colorado Power.

In 1914, he went to Twin Falls as general superintendent of the Great Shoshone and Twin Falls Water Power Co., predecessor of Idaho Power. He served Idaho Power as division manager at Twin Falls from 1918 to 1920, when he went to Boise as general superintendent. He had been a director of the company for a number of years.

George A. Hughes

George A. Hughes, 71, founder and chairman of Edison General Electric Appliance Co. and well known in the West, died Sept. 9 in Chicago. Known as "the father of the electric range," Mr. Hughes was a newspaperman in Fargo, N. D., when he decided to go into the electric business. The company he formed at one time served in Glendive, Mont. He sold it to go to work on converting an oil cook stove to a "wire cooker," and his experiments resulted in manufacture of the first commercially sold

GEORGE A. HUGHES

electric ranges. In 1918, he formed a merger which took in the Hotpoint Heating Appliance Co., Ontario, Calif., and General Electric became owner of the new concern, adding its heating appliance division to the combination. Mr. Hughes became president of the new firm, Edison General Electric Appliance Co.

C. H. Cooke

C. H. Cooke, chairman of the board, Hawaiian Electric Co., died in Honolulu. He joined the company as a director in 1912, in 1913 was elected secretary and in 1926, vice-president. He became president in 1941, on the death of his brother, Richard Alexander Cooke, and was named chairman of the board of directors in 1943.

Mr. Cooke was born in Honolulu in 1876, received his education there and at Yale University. Previous to his association with the utility, he was for many years president of the Bank of Hawaii.

During World War I, he was commissioned Captain in the National Guard of Hawaii, in charge of the Honolulu armory.

R. G. MacDonald

Richard G. MacDonald, 58, assistant director of power for the Bureau of Reclamation at Boulder Dam, died Sept. 20 in Las Vegas, Nev., following a heart attack. Mr. MacDonald was appointed to the post in 1940. Previously, he was an engineer at Boulder Dam for four years.

● ARTHUR PEEL, 73, electrical contractor, died recently at Vancouver, B. C.

TRADE *notes*

Los Angeles Company Now Mitchell Division

Consolidation of the Tru-Ad Co. of Los Angeles with Mitchell Mfg. Co. of Chicago, makers of fluorescent and other lighting equipment, was announced last month by B. A. Mitchell, president of the company. The Los Angeles lighting plant will be operated under the name of Mitchell Mfg. Co., Tru-Ad division, and will serve the states of California, Washington, Oregon, Idaho, Montana, Nevada, Utah, Wyoming, Arizona and New Mexico.

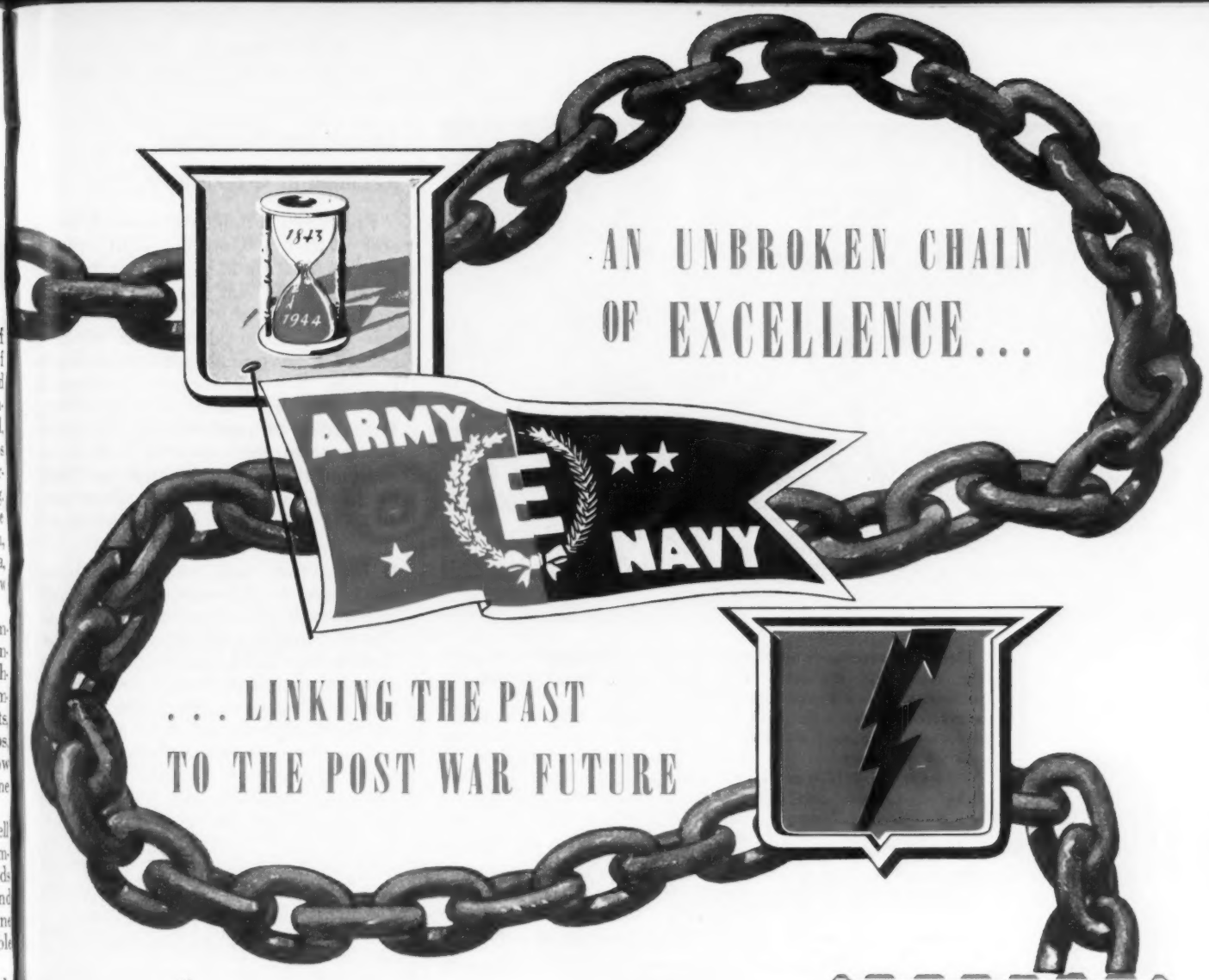
When conditions permit, the company plans to produce at the Los Angeles plant the complete line of Mitchell products, including industrial, commercial and residential lighting units, desk, bed, floor and table lamps, kitchen units, Polaroid lamps, show window lighting, spotlights, Lumitone and Lullaby lamp radios.

In announcing his plans, Mitchell said that he expected a large and immediate postwar demand for all kinds of lighting on the Pacific Coast and that manufacture of the complete line at the Tru-Ad plant would enable faster service at lower cost.

The Tru-Ad company was established 16 years ago and is under its original management, Milton S. Greenwald and Leo E. Greenwald. During the war the factory has been engaged in manufacture of aircraft and naval equipment. In recent years, the company has done extensive work with germicidal lamp equipment, marketing the units under the Tru-Air Ultraviolet Products Co., which also becomes a part of the consolidation.

● ILG ELECTRIC VENTILATING CO. has moved its San Francisco branch office to larger headquarters at 826 Sharon Bldg., 55 New Montgomery St. James S. Rose has been transferred from Cleveland to manage the new office. Other Ilg offices in the West are at Seattle, Salt Lake City, Phoenix, El Paso and San Diego. C. E. Parks, with headquarters in Los Angeles, is manager of the Pacific division.

● SUNSET ELECTRIC CO. at Portland has been reappointed distributor for the Emerson Radio and Phonograph Corp in that area. Sunset has announced that it is planning a postwar distribution plan based on a preference delivery quota to registered customers of the company.



A THIRD STAR HAS BEEN ADDED TO OUR ARMY-NAVY AWARD FOR CONTINUOUS UNINTERRUPTED EXCELLENCE

For over a century Hubbard and Company has consistently turned out products of exactingly high quality and excellence. Since our entry into this cataclysmic conflict we have continued to produce standard pole-line hardware items essential to the electrical power needs of this country. And, at the same time we have been engaged in serving the enormous requirements of our armed services. That we have continued to maintain our long established reputation for outstanding achievement is attested to by the award of a third star to our coveted "E" flag. Over the span of recent years we have expanded our capacity and have perfected further improvements and refinements in our products which will contribute immeasurably to the post-war future that lies ahead. In the future as in the past you can rely implicitly on Hubbard Hardware.

HUBBARD
POLE-LINE HARDWARE INCLUDES

- ★ Standard Pole-Line Hardware
- ★ Communication System Hardware
- ★ Electric Railway Hardware
- ★ Insulator Pins
- ★ Pole Top Fixtures and Steel Cross Arms
- ★ Strain Insulators and Clevises
- ★ High Tension Material
- ★ Secondary Racks and Accessories
- ★ Pole and Cross Arm Brackets
- ★ Street Lighting Equipment
- ★ Rural Electrification Material

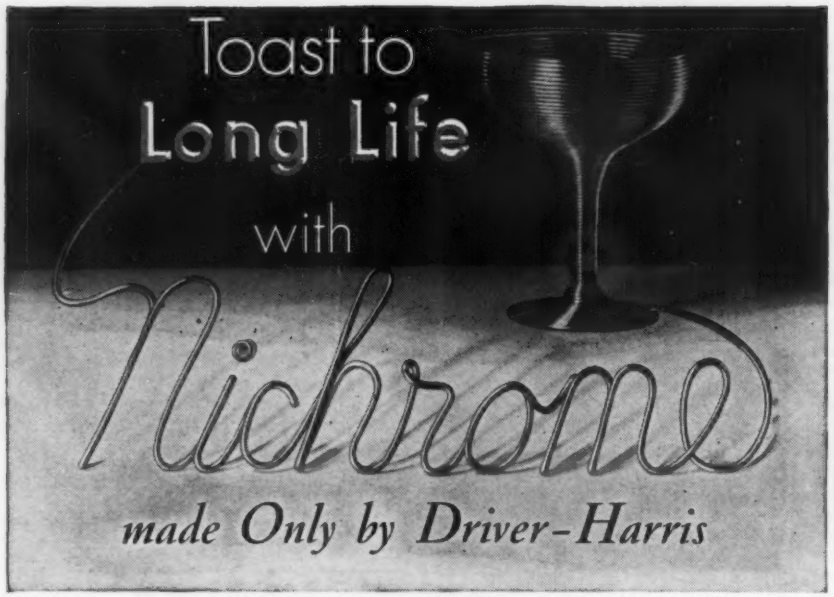
HUBBARD

Hubbard and COMPANY

OAKLAND, CAL PITTSBURGH CHICAGO

HANG THE LOAD ON HUBBARD HARDWARE

HUBBARD



Electrical resistance and heating elements wound with Nichrome* live a longer life of satisfactory service because of perfected heat and corrosion resistance properties.

This exclusive Driver-Harris nickel-chromium product enjoys an enviable record with leading manufacturers of electrical equipment throughout the world.

Nichrome*...is a toast to longer life and improved performance in your post-war products, so specify it and other D-H resistance alloys when buying resistors and heating elements.

*Trade Mark Reg. U. S. Pat. Office

D/H SPECIAL PURPOSE ALLOYS SINCE 1890

Driver-Harris COMPANY

Stocked for the Coast Trade at ANGUS-CAMPBELL, INC.

235-241 San Bruno Ave., San Francisco • 449 So. San Pedro St., Los Angeles • 2122-4th Ave., Seattle

Main Office and Plant: HARRISON, NEW JERSEY

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Electrical West, published monthly at San Francisco, Calif., for October 1, 1944.

State of California, } ss.
County of San Francisco }

Before me, a notary in and for the state and county aforesaid, personally appeared George C. Tenney, who, having been duly sworn according to law, deposes and says that he is the Editor of the Electrical West, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher, McGraw-Hill Company of California.....68 Post St., San Francisco 4, Calif.
Editor, George C. Tenney.....68 Post St., San Francisco 4, Calif.
Managing Editor .....None
Business Manager.....Roy N. Phelan, 621 S. Hope St., Los Angeles 14, Calif.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

McGraw-Hill Company of California, San Francisco, Calif.; McGraw-Hill Publishing Company, Inc., New York City; James H. McGraw, New York City; Howard Ehrlich, New York City; R. A. Balzari, San Francisco, Calif.; N. A. Bowers, San Francisco, Calif.; George C. Tenney, San Francisco, Calif.; John W. Otterson, San Francisco, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amounts of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is.....(This information is required from daily publications only.)

GEORGE C. TENNEY, Editor.

Sworn to and subscribed before me this 14th day of September, 1944.

(SEAL) W. E. SCHORD,
In and for the City and County of San Francisco, State of California.
(My commission expires June 2, 1946)

Electric Iron Production Resumed at G-E Factory

Production of electric irons at General Electric's Ontario, Calif. plant was resumed Sept. 9 under a permit granted by the War Production Board.

Manufacture of irons marks the first resumption of production of civilian household electrical appliances bearing the General Electric trademark since the freeze order of June 1942. Permission to produce 421,000 irons was granted the company, and it is expected that this quota will be filled by the end of the year. The quota was 40% of the plant's 1940 production.

● EDUCATION and the possibilities for future development of underfloor systems will be carried to the General Electric Supply Co.'s branches in the West by the H. H. Robertson Co. in a series of meetings. While the General Electric Co. has fostered the sale of the H. H. Robertson floor system, this will be the first time the message has been carried to the supply company. Joseph J. Siddall, electrical engineer for the Robertson company, Arthur C. Prange, in charge of supply sales for General Electric Co. at Bridgeport and L. F. Kummel, supervisor of underfloor distribution systems for General Electric Supply Co., will conduct the meetings. Schedule for the meetings with the supply company organization and with architect and engineer groups is as follows: Oct. 9, Los Angeles supply company; Oct. 10, architects and engineers; Oct. 13 and 14, San Francisco; Oct. 16 and 17, Portland; Oct. 19 and 20, Seattle; Oct. 24 and 25, Salt Lake City; Oct. 26, Denver for G.E. Supply only since a previous meeting has been held for architects and engineers.

● AUTO EQUIPMENT Co. has been appointed distributor of Emerson Radio products in the Denver area. E. O. Hunting is president and I. H. Parks, sales manager, of the firm, which has handled radios and heavy appliance lines for 35 years. The company plans to participate in the Emerson P.D.Q. plan, by which dealers issue preference certificates to consumers for delivery of radios when available.

● B. L. SLATER & Co., electrical contractors, have recently moved from Vallejo to Redding, Calif., where the new address is 2825 Market St. The company specializes in commercial, industrial and public works installation and has established a motor winding and repair shop. It is run by Bill Slater, formerly of Los Angeles.

● PACIFIC ELECTRONICS CO. of Spokane has been awarded a Navy contract for manufacture of about 9,000 electric units at a figure near $900,000, according to A. C. Nash, company sales manager. Work on the contract will begin soon with two shifts of about 100 men. This will increase the plant employment 25 to 30%, it was stated.

● MCLENNAN, MCFEELY & PRIOR, LTD., has announced plans to build a new store at Port Albernai, B. C. The company, which handles electrical goods in addition to hardware and furniture, has wholesale stores in Vancouver, New Westminster and Victoria and retail stores in leading British Columbia cities.

● AMERICAN ELECTRIC CONSTRUCTION CO., San Francisco, has moved to much larger quarters at 955 Howard St. from 462 Bryant. Engaged in war production construction during the past few years, the company is making extensive plans for postwar development of its markets.

● CROSLEY CORP. has announced appointment of the Southwestern Electrical Appliance Co. of Amarillo as distributor in northwestern Texas. The Texas company is owned by Harvey Southworth and occupies a three-story brick building at 620 Tyler St.

● HUBBARD and Co.'s Emeryville, Calif., plant was awarded its third renewal of the Army-Navy "E" award in August. Presented first in January, 1943, for excellence in production, the award has been held by the plant continuously since.

● LITTON ENGINEERING LABORATORIES, Redwood City, Calif., manufacturers of special radio and electronic equipment, was awarded the Army-Navy E in ceremonies at the plant last month.

● MOTT ELECTRIC LTD., New Westminster, B. C., has purchased property in New Westminster, and plans to erect a building there when materials are available again.

● APPOINTMENT of the Ray Thomas Co. of Los Angeles as southern California distributor for Majestic Radio & Television Corp. was announced by the company.

● CRAIG-HAYWARD ELECTRICAL CO., LTD., has set up business at 415-6 Rogers Bldg., in Vancouver, B. C., as electrical manufacturer, contractor and dealer.

Electrical Engineer

between 25 and 40 years of age —experience in Class B insulation of motors and equipment preferred for sales engineering work —ESSENTIAL ACTIVITY—PERMANENT — SALARY OPEN — San Francisco Bay Area, Box Electrical West.

BUY WAR BONDS

WESTERN REPRESENTATIVES
FRED W. CARLSON, Seattle
J. G. CORRIN, Los Angeles
R. F. HAMILTON, Denver
METER SERVICE CO., Salt Lake City

SWITCHES, ENCLOSURES, ACCESSORIES

METER DEVICES COMPANY CANTON, O.

do you remember?

Watching the flames through the windows of a pot bellied stove? Those windows were probably thin sheets of Asheville Mica, a product that has been keeping heat in its place for a long time.

Now, as then, where ever there is a need for an insulator that combines high dielectric strength with low power loss through heat, you can depend on Asheville Mica to provide the ideal insulation. It has qualified as **"strategic mica,"** by meeting the rigid requirements of Army, Navy and Civilian engineers, and is now doing heavy insulation duty in the electric circuits of our front line planes, tanks, radar and other acoustical equipment.

And now, as then, Asheville Mica Company manufactures Stove and Furnace Mica of uniform high quality . . . guaranteed free from black dotted, clay stained or broken sheets.

We will gladly supply Asheville Mica Company price lists and data regarding specific applications.

MARWOOD LIMITED

SEATTLE . PORTLAND . SAN FRANCISCO . LOS ANGELES

950

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PROFILES *of the month*

Left: L. W. Dick, recently named Pacific Power & Light Co. district manager at Yakima, succeeding the late R. B. Bragg. He was transferred from Dayton

Below: Westerners attending the conference for Crosley distributors in Cincinnati last month: H. W. Eskuche, Western Supply Co., Salt Lake City; H. D. Severson, Standard Sales Co., Spokane; L. E. McCurry, Heating & Air Conditioning Supply Co., Reno; N. B. Dinkel, Crosley Corp., Alameda. L. C. Truesdell, Crosley commercial division sales manager, Cincinnati, is at right

For safeguarding war production against "fire, sabotage, accident and possible air attack, the National Security Award has been given to several utilities in the West. Top below: Northwestern Electric Co. President L. T. Merwin, receives the citation from Major General Robert H. Lewis, while Paul B. McKee looks on; bottom, pictured at the presentation to Southern California Edison Co. are from left: Major N. C. Owen, C. E. Houston, vice-president and general manager; President Harry J. Bauer, R. G. Hackett, Major James R. Barker, Lieutenant Governor F. F. Houser, Sheriff E. W. Biscailuz, Lt. Comdr. W. D. Bretz

Your WAR CHEST Dollars Go Far . . .

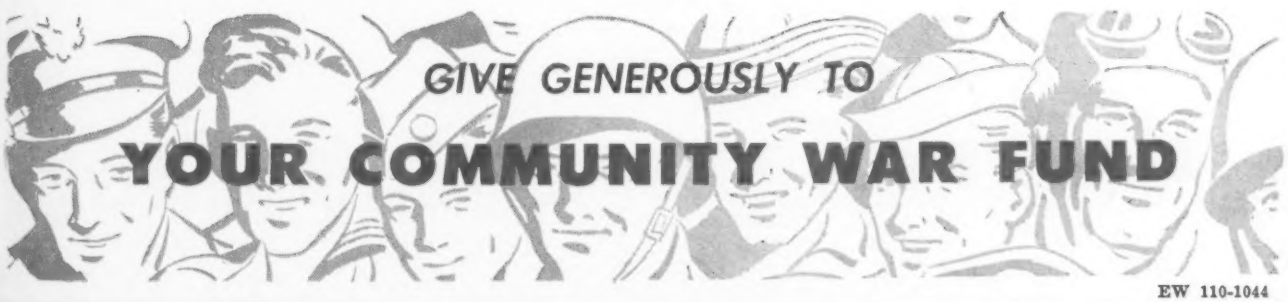
The dollars you give to the War Chest work hard both overseas and at home.

Wherever our boys are in service — in training camps, in foreign lands, at sea on battle or convoy duty, or in dreary prison camps they need helpful attention, good music or a chance to see a good show from home. Your War Chest dollars travel far to give them that.

At home, Your War Chest is on a fighting front too. In hospitals and clinics, War Chest dollars battle disease, improve community health. In community centers, nurseries, children's institutions, these dollars help prevent child neglect, family crack-ups and juvenile delinquency. Your Chest maintains homes for the aged and supports youth organizations.

During this month of October you will be asked to give to the War Chest in your community. Give more than you now plan. There is a miracle job to be done—make it a miracle by you!

PACIFIC GAS AND ELECTRIC COMPANY



EW 110-1044

***This month...* 2**

INDUSTRY PROMOTIONS OF SPECIAL INTEREST

1 P·G·and E· urges cleaning and reconditioning of industrial lighting equipment.

Because LIGHT is of such paramount importance in our war production... and because so much light is wasted by not having properly painted walls and ceilings and by allowing dirt to accumulate on lamps and reflectors... Pacific Gas and Electric Company is urging a general clean-up. The reasons are convincingly set forth in a series of mailing pieces. Help on individual problems is provided by the company's industrial lighting engineers. Outside firms are invited to follow up with specific offers of cleaning and reconditioning service.

2 Home Planning Institute organized in many new towns.

The Home Planning Institute lecture courses which proved so popular in southern California last spring are now being put on throughout the entire state. Sponsors include business firms and usually the Adult Education Department of the local schools. This is a program of vital interest to the electric industry for it offers an unprecedented opportunity to tell the story of comfort and livability through modern home equipment... laundry and kitchen equipment, adequate wiring and sight-saving lighting. If your town is not already planning such a course, the Association will gladly direct you to people who can give you expert help in organizing and finding speakers. Write either office, but *do it now!*

PACIFIC COAST *Electrical* ASSOCIATION

601 WEST 5TH STREET, LOS ANGELES 13 • 447 SUTTER STREET, SAN FRANCISCO 8